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INTERNATIONAL HEALTH EXHIBITION

HANDBOOKS

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Ambulance Organization,
Equipment, and Transport.

Surgeon-Major G. J. H. EVATT, M.D.,

ARMY MEDICAL DEPARTMENT.

ILLUSTRATED.

PRINTED AND PUBLISHED FOR THE
Executive Council of the International Health Exhibition,
and for the Council of the Society of Arts,

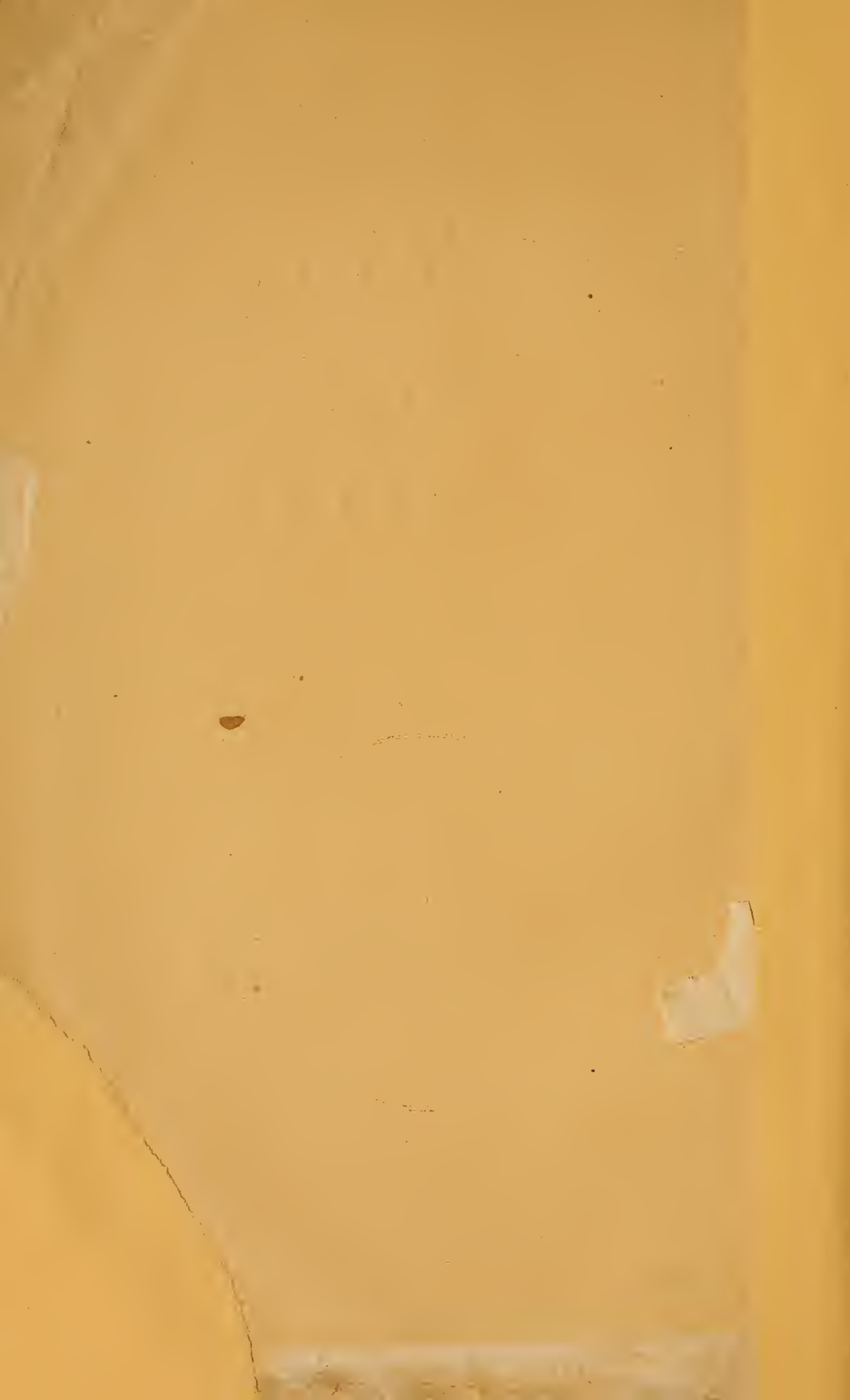
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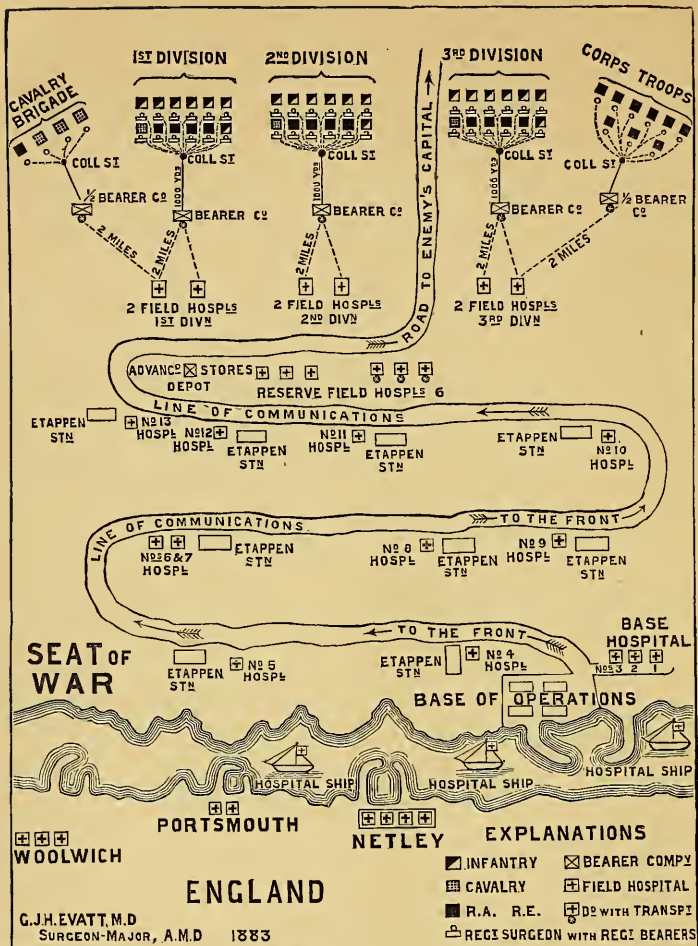
INTERNATIONAL HEALTH EXHIBITION,

AND 23, CHARING CROSS, S.W.

1884.

ONE SHILLING





PLAN OF THE AMBULANCE ARRANGEMENTS OF AN ENGLISH ARMY CORPS; STRENGTH, 36,000 men, 12,900 horses, 90 guns, 1153 waggons.

EXPLANATION OF DIAGRAM.

This Diagram shows each individual Battery, Battalion or Regiment in an English Army Corps, and also the number of units in each Division and Brigade. In the rear of each unit is the Regimental, Battalion, or Battery Surgeon, with his Regimental Ambulance detachment.

The dotted lines show the path of the wounded, *via* the "collecting stations," to the Bearer Companies of each division. Do not confound these with the Regimental Bearers working under the Regimental Surgeons.

Behind the Bearer Companies are the two Field Hospitals of each Division. Massed in their rear on the road leading to the Army are the six reserve Field Hospitals of the Army Corps, not as yet posted to Divisions.

The winding road is the Line of Communications, which may be 100 to 200 miles in length, and which extends from the Base of Operations to the Army in the Front. Along it are placed at the various Etappes, or Halting-stages of the Army, the thirteen Field Hospitals of the Line of Communications.

The winding road is so drawn to save paper.

At the Base of Operations are grouped three or more Field Hospitals constituting the Base Hospital.

The ships are the Hospital-ships which convey the sick and wounded from the Base Hospital to the English Hospitals at Netley, Portsmouth, Woolwich, &c.

International Health Exhibition.

LONDON, 1884.

AMBULANCE ORGANIZATION,
EQUIPMENT, AND TRANSPORT.

BY SURGEON-MAJOR G. J. H. EVATT, M.D.,

ARMY MEDICAL DEPARTMENT.



ENGLISH AMBULANCE SOLDIER.

PRINTED AND PUBLISHED FOR THE
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P R E F A C E.

THIS primer or elementary handbook of Ambulance Organization, Equipment, and Transport, is written for the use of the casual visitor to the International Health Exhibition of 1884 who, entering the building quite ignorant of Ambulance aims and objects, desires to get a general, but elementary idea of the work.

There is nothing novel in these pages, and the specialist will not learn anything from them. They are simply cullings and extracts from the great writers' works on the subject.

I desire to offer my heartiest thanks to those who have aided me in this work. Foremost of all I thank Surgeon-General Longmore, C.B., the Professor of Military Surgery at Netley, for his extreme courtesy and kindness in allowing me the free use of the plates in his exhaustive special works on "The Transport of Sick and Wounded Troops," and on "Gunshot Injuries." Where the woodcuts were too large for the pages, I have had them copied by his permission.

Inspector-General Macdonald of the Royal Navy has also, in the most liberal manner, allowed me the use of his woodcuts and manuscript from his well-known work on "Naval Hygiene."

Sir John Watt Reid, K.C.B., the Medical Inspector-General of the Navy, has also been particularly kind in granting me the use of plans, &c., for which I beg to thank him.

Mr. John Furley, the well-known ambulance worker of England, has also been very good in giving me his valuable aid.

Baron Mundy of Vienna, the leading ambulance authority in Europe, has furnished me in the most liberal manner with copies of his detailed work on "Railway Ambulance Systems," of which I have fully availed myself.

Ober Stabs Arzt Starkè, of the Imperial German Army, has also been very kind in giving me information, and I have utilised several of his woodcuts from his elementary ambulance work.

Mr. John Collings, who has engraved several woodcuts for this primer, is also entitled to my thanks for his good work and his many useful suggestions.

G. J. H. EVATT, M.D., *Surgeon-Major,*
Army Medical Department.

ROYAL MILITARY ACADEMY, WOOLWICH,
May, 1884.

CONTENTS.



PREFACE	PAGE V
---------	----	----	----	----	----	----	----	-----------

CHAPTER I.

INTRODUCTORY	I
--------------	----	----	----	----	----	----	----	---

CHAPTER II.

WAR AMBULANCE ARRANGEMENTS.

THE AMBULANCE ARRANGEMENTS OF AN ARMY IN THE FIELD.

Difference between ancient and modern war—The work of Larrey and Percy in improving Ambulance arrangements—The Medical arrangements of an English Army Corps—The Battalion Help—The Bearer Company—The Field Hospital—The Line of Communications—The Base Hospital—The Hospital Ships—The Medical Staff of the Army—The Militia Service—The Volunteer Service—Defects of an English War Hospital	5
--	----	----	----	----	----	----	----	---

CHAPTER III.

VOLUNTEER WAR AID.

THE KNIGHTLY ORDERS AND THE RED CROSS SOCIETIES.

The Knightly Orders and their work—The United States Sanitary Commission—The foundation of the Red Cross Movement—The Geneva Convention—The good and the weak points of the movement—Little help given to the English Army by Red Cross Societies—The work that might be done by the English Red Cross Society—The Johannritter Order of Germany—The “Deutsche Ritter” Order—The Austrian Maltese Order—The Italian Branch of the Knights of
--

	PAGE
St. John—The English Order of the Knights of St. John—The Addresses of the Head Quarters of the European Red Cross Societies—The Periodical Press of the Red Cross—Gustave Moynier's "Red Cross and its Future.".. ..	14

CHAPTER IV.

CIVIL OR PEACE AMBULANCE ARRANGEMENTS.

The Ambulance arrangements in American Cities—Need of the same in England—The treatment of Drunken men in the Streets—Street Stretcher-lockers—A London Ambulance Service—Railway Ambulance arrangements—Poor Law arrangements—Example of a Municipal Ambulance System—The Metropolitan Asylums Board and its work—The Hospitals and Ambulance arrangements—The old Parochial System and its defects—The Ambulance Steamer 'Red Cross' on the River Thames—Rural Ambulance Systems—The Battle District of Sussex—Lady Brassey's System—The Town of Brighouse in Yorkshire—Civil Ambulance Societies—The St. John's Ambulance Association and its work—The good done by it—The London Ambulance Service—The St. Andrew's Ambulance Association—The Samaritan Society of Kiel	23
---	----

CHAPTER V.

PERSONAL "FIRST-AID" EQUIPMENT.

The Surgical Havresack—Water Bottles—Field Companions—The Soldier's first Dressing—Means of carrying it—Identification Label—Esmarch Triangular Bandage—Esmarch's Braces	36
--	----

CHAPTER VI.

AMBULANCE SICK-TRANSPORT APPLIANCES CARRIED BY MEN.

STRETCHERS, HAMMOCKS, DHOOOLIES.

The Faris Stretcher—Baron Percy's Stretcher—An Ideal Stretcher—Furley's Lowmoor Jacket—Hammocks—Dhoolies—Dandies—Need of Stretchers in the Streets	41
--	----

CHAPTER VII.

AMBULANCE SICK-TRANSPORT CONVEYANCES WHEELED BY MEN.

English Military wheeled Stretcher—The Ashford Litter—Neuss Litter with wheeled support	48
---	----

CHAPTER VIII.

AMBULANCE EQUIPMENTS CARRIED BY MULES OR HORSES.

	PAGE
Need of good Mule Equipment for our varying wars—The English Medicine Panniers—Mule Cacolets—Mule Litters—Ideal Mule-loads for a Field Hospital	53

CHAPTER IX.

CAMEL CARRIAGE.

Camel Kadjawas—Bryce's Camel Dhoolie	60
--	----

CHAPTER X.

WHEELED AMBULANCE EQUIPMENT AND SICK-TRANSPORT VEHICLES DRAWN BY HORSES.

Ambulance Equipment Waggon—The Surgery Waggon of the Bearer Company—The Pharmacy Waggon of the Field Hospital—The Store Waggon of the Field Hospital—The Kitchen Waggon of a Field Hospital—The Water Cart—The Laundry Waggon—The Electric Light Waggon—The Army Regulation Sick-transport Waggon—Its construction—The Austrian Red Cross Sick-transport Waggon—The United States Rucker plan of arrangements of Seats and Stretchers—Civil Ambulance Sick-transport Waggon—The Howard Sick-transport Waggon—Davy's Ambulance Waggon—The Furley Sick-transport Waggon—The Atkinson-Philipson (Newcastle) Sick-transport Waggon—Infectious-disease Sick-transport Waggon	62
---	----

CHAPTER XI.

RAILWAY AMBULANCE AND SICK-TRANSPORT SYSTEMS.

Crimean Railway carriage of Sick—The younger Baron Larrey's work—Dr. Gurlt's efforts—The American Railway Sick-transport systems—Description of Baron Mundy's organization of the Austrian Maltese Knights Order's Ambulance Trains—Descriptions of the various carriages in it—Extemporised use of Railway Carriages for Sick-transport—Zavodovsky's system—Grund's system—Beaufort's system—The Hamburg system—Civil Railway-transport systems. ..	89
--	----

CHAPTER XII.

MARINE AMBULANCE ARRANGEMENTS.

PAGE

Various Rope Knots used by Sailors in carrying wounded men—	
The ordinary Navy Cot—The Lowmoor Jacket—MacDonald's	
Ambulance Lift—MacDonald's Ambulance Lowerer—The	
Gorgas Ambulance Cot—Ambulance Launches—Ambulance	
steamers, 'The Red Cross'—Hospital ships, 'The Victor	
Emmanuel'	103

CHAPTER XIII.

AMBULANCE TENTS AND HUTS.

Proposals for the more general use of Huts and Tents in Infectious	
Disease—The English Bell Tent—The Hospital Marquee—	
Indian Tents—American Tents—The Tollett system of Tents	
—The Dæcker Felt Huts	115
 CONCLUSION	 122

LIST OF ILLUSTRATIONS.

FIG.		PAGE
	PLAN OF THE AMBULANCE ARRANGEMENTS OF AN ENGLISH ARMY CORPS <i>Frontispiece</i>	
	ENGLISH AMBULANCE SOLDIER <i>Title-page</i>	
1.	REGIMENTAL AMBULANCE AID AT WORK	7
2.	VARIOUS EXTEMPORISED AIDS TO WOUNDED	9
3.	DETACHMENTS OF THE BEARER COMPANY AT WORK ..	10
4.	PLAN OF LONDON METROPOLITAN ASYLUMS AMBULANCE SYSTEM	29
5.	AMBULANCE ORGANIZATION ROUND THE BATTLE DIS- TRICT OF SUSSEX	32
6.	MEDICAL FIELD COMPANION	37
7.	ESMARCH'S TRIANGULAR BANDAGE	39
8.	ENGLISH ARMY REGULATION STRETCHER, 1884	42
9.	BARON PERCY'S STRETCHER—BEARERS IN MARCHING ORDER	43
10.	BARON PERCY'S STRETCHER—FITTED FOR CARRYING WOUNDED	43
11.	FURLEY'S "LOWMOOR JACKET"	44
12.	THE INDIAN DHOLIE	46
13.	MILITARY STRETCHER ON WHEELED SUPPORT	48
14.	FURLEY'S ASHFORD LITTER	49
15.	THE SAME, DETACHED FROM WHEELED SUPPORT ..	49
16.	THE ST. JOHN'S AMBULANCE LITTER ON WHEELED SUPPORT	50
17.	THE ST. JOHN'S AMBULANCE STRETCHER DETACHED ..	51
18.	MEDICINE PANNIERS CARRIED ON A MULE	54
19.	MULE PANNIERS ARRANGED TO FORM AN OPERATION TABLE	55
20. 21.	MULE PANNIERS OPEN TO SHOW CONTENTS	56
22.	MULE CACOLETS OR CHAIRS	57
23.	MULE LITTER WITH WOUNDED SOLDIER	58
24.	SICK MEN IN CAMEL KADJAWAS	60
25.	SURGERY WAGGON OF THE AUSTRIAN RED CROSS SOCIETY	64
26.	THE SAME, WITH OPERATING TENT PITCHED	65

FIG.	PAGE
27. THE ENGLISH SICK-TRANSPORT WAGGON	72
28. SICK-TRANSPORT WAGGON (AUSTRIAN RED CROSS) ..	76
29. SECTION OF THE RUCKER SICK-TRANSPORT WAGGON ..	79
30, 31. DR. HOWARD'S SICK-TRANSPORT WAGGON	82
32. THE SAME (INTERIOR)	83
33. DAVY'S AMBULANCE WAGGON	85
34. THE FURLEY AMBULANCE WAGGON	86
35, 36. KITCHEN WAGGON—AUSTRIAN AMBULANCE RAILWAY TRAINS	94
37, 38. SICK-TRANSPORT RAILWAY CARRIAGE—AUSTRIAN AMBULANCE TRAINS	95
39. ZAVODOVSKY'S METHOD OF STRETCHER-SUSPENSION IN A RAILWAY GOODS WAGGON	98
40. GRUND'S SYSTEM OF CONVERTING A GOODS WAGGON ..	99
41. BEAUFORT'S RAILWAY STRETCHER-RESTS	99
42. HAMBURG SYSTEM OF STRETCHER-SUSPENSION IN A GOODS WAGGON	100
43. MACDONALD'S NAVAL AMBULANCE LIFT	105
44. MACDONALD'S AMBULANCE LOWERER	105
45. THE SAME, FOLDED UP	106
46. THE GORGAS AMBULANCE COT	107
47. AN AMBULANCE LAUNCH	108
48. THE AMBULANCE STEAMER 'RED CROSS'	109
49. SECTION OF A HOSPITAL SHIP	112
50. PLAN OF UPPER DECK, 'VICTOR EMMANUEL'	113
51. PLAN OF HOSPITAL DECK, DITTO	113
52. ENGLISH CIRCULAR TENT AND HOSPITAL MARQUEE ..	117
53. AMERICAN HOSPITAL TENTS	119
54. TENT ON THE TOLLET SYSTEM	119

AMBULANCE ORGANIZATION, EQUIPMENT AND TRANSPORT.



CHAPTER I.

INTRODUCTORY,

I PROPOSE in the following pages to deal in a simple and entirely popular manner with the highly interesting subject of Ambulance Organization, Equipment and Transport.

I propose to treat the whole subject, whether as regards its application to the naval and military forces of the country for war purposes, or to the far larger needs of the civil population for the aid of those suffering from sickness or accident in ordinary every-day life, altogether from a popular standpoint, and to deal with the subjects in such a manner that the chance visitor to the Health Exhibition may be able to form some idea, however elementary, of what ambulance matters mean.

The specialist in such subjects will find in these pages little that is novel. The pamphlet is entirely a compilation, and very few lines indeed will be original.

In dealing in this primer with so large a subject it will be seen that only a very brief notice can be given of each separate group, but, as far as possible, reference will be made, pointing out where those interested in the subject can find fuller information.

By ambulance organization, equipment and transport, one means those various arrangements, whether for the military or civil needs of the people, by which first aid and

suitable transport is given to those suffering from sickness or accident up to the moment of their arrival at permanent hospitals, and a description of the systems, organizations, and equipment used for the purpose of giving this aid. The purely medical treatment side of this subject will not be dealt with in these pages, but rather the ways in which such treatment is placed in a position to do its work, and the various aids gained by definite organization in furthering such an object.

It may safely be said that ambulance aid and the good it can bestow upon humanity is still almost undeveloped. There is a growing spirit of humanity in the world, there is an intense desire to mitigate as far as possible the bitterness of human suffering, but it is the exact knowledge of how best to do it that the world needs. The want of light is really the obstacle, and hundreds of people are ready to do good if only they knew how to do it. To-day we are at the threshold of the true method, for we are teaching the people how to be truly humane, and when we have taught the individual this lesson, the municipality and the nation of which he is a citizen will gradually put into execution the wish of the people.

Is there one amongst us, who, either in war or peace, when help has been needed has not found the desire to give it in abundance, but it is the knowledge of how to give it that was absent.

Let us as the years go on teach the people, and all will be well. When we have taught the nation how their bodies are organized, of the laws that govern them, of the ailments that attack them, and of the injuries that mar them, then, and then only, will a real beginning be made to minimize by science the ills that befall humanity. The more this knowledge is spread through the land, the more importance will attach itself to ambulance matters of every kind, for it is a large factor in minimizing suffering.

The spread of the ambulance movement in civil life and amongst civil communities has arisen mainly from its development as a means of giving aid to the wounded in

war. The nations have been horror-stricken by the intense sufferings of a Crimean army, by the enormous mass of wounded after Solferino, after Gettysburg, after Sadowa, or at Worth; but all this suffering, great as it has been, has really been as nothing by comparison with that ever-constant, never-ending pain endured by the mass of civilians daily injured in railway accidents, in the streets, in the mines, and in all our varied industrial developments. When we think of these sufferers, as well as of the great numbers of sick persons travelling in unsuitable conveyances while suffering from dropsies, heart disease, rheumatism and other painful ailments, we must admit that, however great the pain that war has inflicted upon humanity, the longer eras of peace have contributed a far larger quota of grievous suffering. But the attention of the world has been riveted by the concentrated horrors of a great battle, and out of the efforts made to mitigate such sufferings, good in the end has come to the civil workman and to the whole of that industrial army daily at work throughout the country.

The plan I propose following in these pages will be to deal in order with the various groups into which the subject divides itself, leaving the plates to do much of the teaching and connecting them by a few lines of letterpress.

I will first of all describe in general terms the organized system by which ambulance help is given to armies in the field, explaining the official military methods of working such aid, and then referring to those various knightly orders and Red Cross auxiliary societies organized for supplementing this aid during war time.

Then I will endeavour to make a *précis* of municipal ambulance systems at work at home and abroad for the help of those suffering from injury or disease in civil life, and follow it up by indicating the various civil associations working with the object of urging forward this civil aid to the sick or injured.

I then propose to run rapidly through the detail of the various ambulance equipments, whether personal as carried by men, portable as carried by animals, wheeled convey-

ances for carrying the sick, railway ambulance arrangements, tents and huts used for temporary shelter, and winding up with a brief outline of nautical ambulance, or the methods used on board ship to carry or shelter the suffering. Owing to the limited space at my disposal I will in each of these sections take a type or special pattern, and, describing it, leave it to the reader to compare the type with the various evolutions from that type which he may find either in the Exhibition or in his various studies of the subject. I have here again to repeat that these pages are essentially a primer or elementary text-book, and must be received in that light.

CHAPTER II.

WAR AMBULANCE ARRANGEMENTS.

THE AMBULANCE ARRANGEMENTS OF AN ARMY IN
THE FIELD.

[*Vide Frontispiece.*]

Difference between ancient and modern war—The work of Larrey and Percy in improving Ambulance arrangements—The Medical arrangements of an English Army Corps—The Battalion Help—The Bearer Company—The Field Hospital—The Line of Communications—The Base Hospital—The Hospital Ships—The Medical Staff of the Army—The Militia Service—The Volunteer Service—Defects of an English War Hospital.

WHEN we look back over the history of the past in reference to the treatment of the wounded in war, we find that fighting in the old days was more logically carried out than at the present time.

When two armies met in ancient times the combat became a series of personal encounters, man opposing man and closing with his adversary in hand-to-hand fight. In those days few wounded existed, for after the battle, or during the fight itself, the stricken were slain outright.

To-day armies rarely close upon one another, large quantities of wounded from distant firing exist, and the spirit of humanity prevents the killing of wounded enemies. But in all our English foreign wars in India, China, New Zealand, Ashanti, Zululand, Egypt and Affghanistan, the old merciless principle is still in force with our enemies, and to be stricken in these wars and to fall into the enemies' hands is to be slain.

Another marked difference in the wars of the two past

centuries is that the old clan or tribal organization, as well as the feudal organization, has passed away in civilised countries.

There can be no doubt that the clan or tribal feeling supplied a tie between the chief and his men that rendered it impossible for a sick or wounded clansman to be abandoned to his fate.

In feudal times the baron, although he claimed the service of his retainer, had also in return to render service by protecting his "man," and no doubt a certain care had to be given to all followers of such a feudal chief.

With the breakdown of these old-world links, and with the foundation of standing armies, it is a question if the ultimate private man, that last unit who had in his clan or with his lord a definite link, has not lost on the whole. In becoming simply a unit in a great army, if that great army has not a good system of aid to the wounded, the individual private soldier loses most of all. To-day it would be absurd to say that our own, or indeed any foreign army, is yet completely organized in an ambulance sense, but much progress has been made in the past thirty years in achieving efficiency, and there is much promise of good results in the immediate future; the one thing needed is an educated public opinion.

Modern military ambulance arrangement dates its first step forward in a marked manner to the labours of Baron Larrey and Baron Percy, surgeons of the French Army during the wars of the French Revolution and the First Empire.

Larrey seems to have been the first to have devised a system of light ambulance transport carriages to convey the wounded rapidly from the battlefield to the field hospital, always some distance in the rear; and Percy has the credit of being the first to organize a regular corps of ambulance stretcher-bearers to carry the wounded from under fire, and from the actual fighting line itself to organized "dressing stations" immediately behind the very front ranks of the army.

Both these first steps in more perfect organization of ambulance aid have since then been carried to a far more definite development, and practically the clear lines of the German military medical system is now followed in all modern armies. This system may be summed up briefly as one freeing the front of the army from all sick and wounded, and evacuating all seriously sick to the great hospitals on the lines of communication, or at the base of operations.

The system can be more easily gripped by studying

Fig. 1.



REGIMENTAL AMBULANCE AID AT WORK—CAVALRY HELP TO WOUNDED.
(After Ruhlemann.)

the diagram of the ambulance arrangements of an English Army Corps which forms a frontispiece to this handbook.

An English Army Corps is the highest unit of military organization we have in the English military system, and any great army would consist of several Army Corps grouped together. If then we understand the arrangement of a single Army Corps, we can easily follow the larger arrangements.

The total strength of an English Army Corps is about 36,000 men, with ninety pieces of artillery. This body is commanded by a general, and is medically administered by a surgeon-general on his staff.

The Army Corps is divided for command into three

military divisions of all arms, one detached and separate cavalry brigade, and a body of reserve artillery and engineers called the corps troops.

Each division is again subdivided into twelve military units grouped in brigades and divisional battalions or batteries. The cavalry brigade has three regiments of cavalry and a battery of horse artillery, and the corps troops consist of five batteries of artillery (thirty guns) and four field units of engineers.

With each of these units, be it battalion, regiment or battery, on mobilisation for war, a medical officer is placed. He is the sanitary supervisor of the unit, and is a staff officer of the commander of the unit, and he remains with the unit throughout the campaign.

He has a certain amount of portable drugs and dressings supplied to him, and carried in "Field Companions," and he is supposed to treat any trivial cases of illness of a few days' duration ; but no regimental hospital properly so called now exists in our own or any European army.

All seriously sick or wounded are now treated in divisional hospitals, of which more presently.

For ambulance aid this battalion medical officer has placed under his command two soldiers per company equipped with stretchers and surgical haversacks. These men have taken the place of the old scratch system of employing bandsmen, and they give aid to the regimental wounded under fire, and are called the regimental stretcher or ambulance detachment. They are in no way to be confounded with the "Divisional Bearer Companies."

When the regimental medical officer has given what rough help he can to the wounded under fire he sends them to the rear by his regimental bearers, and here a new organization, constituting an entirely new departure in our army, is met with : this is the Divisional Bearer Company. With each of the three divisions of an Army Corps is posted a Bearer Company completely non-regimental, and being really a divisional medical unit serving under the general and principal medical officer of the division. Half of such

a company is attached to the cavalry brigade and half to the corps troops. This makes a total of four such companies in an army corps.

Each company consists of eight surgeons and some two hundred and six Army Hospital Corps stretcher-bearers and transport drivers. These stretcher-bearers are trained in ambulance drill and first aid to the wounded, and in the

Fig. 2.



REGIMENTAL AMBULANCE AID—VARIOUS EXTEMPORED AIDS TO WOUNDED.

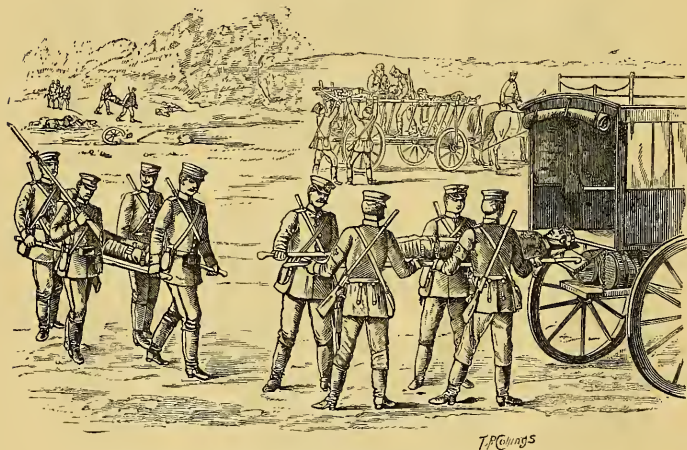
(After Starcke and Ruhlemann.)

formation of dressing stations. Each company has two surgery waggons, water carts, and thirty-three ambulance transport waggons.

The surgery waggons are fitted up with boxes and baskets containing surgical dressings and instruments, cooking utensils, and medical comforts for the wounded. Each waggon has also an operating table and tent for surgical service at the dressing station.

These companies move directly in the rear of the fighting line, and having pitched the operating tent and dressing station, and left a suitable staff to assist there, they send forward the waggons to a "collecting station" further ahead, and just on the verge of the musketry fire. From this they again send forward the stretcher-bearers, who go on to the actual battlefield and collect and give a first dressing to the wounded, stop bleeding, give water and stimulants, and carry back the wounded to the collecting station and transfer them to the ambulance waggons. The

Fig. 3.



DETACHMENTS OF THE BEARER COMPANY AT WORK.
(After Starcke and Ruhlemann.)

regimental stretcher-bearers likewise co-operate, either loading their wounded directly into the ambulance waggons or handing them over to the bearer company staff on the field. The transport waggons then carry the wounded to the dressing station properly so called, where a complete examination is made of the wounded, where regular food is given, and where a classification of the cases can be made. From this place the wounded are sent back to the field hospitals of the division further in the rear, or if these hospitals are delayed in reaching the rear of the army, as

they often are, the bearer company dressing station becomes for the time a very advanced field hospital, where the wounded can receive a rough attendance pending the arrival of the hospitals upon the field.

We now come to the field hospitals. These units have replaced the forty-nine little hospitals which in olden days would have marched in the front line of an army in the field. Every English Army Corps has twenty-five field hospitals, each supposed to accommodate and nurse 200 sick and wounded. Of these twenty-five hospitals two are attached to each division, making a total of six, and six more are in reserve behind the fighting front of the army and ready to replace the divisional field hospitals when the latter become full of sick and are no longer in a position to advance with the force. Thirteen field hospitals are placed along the communication line at the various *étappes* or halting stations of the army, and at the base of operations three or more of these are grouped to form a base hospital, one of the most essential institutions with an army in war time.

A soldier if hit in the front of the army is roughly dressed by the battalion doctor, he is then taken to the divisional dressing station and completely examined and fed, thence he passes to the divisional field hospital, where if he be trivially hurt he remains, recovers, and rejoins his battalion, but if seriously sick or injured is sent back by the lines of communication towards or to the base hospital. Here if he recovers he again is sent forward and rejoins his corps, but if completely injured and broken down, he is placed in the hospital ships, and in due course arrives at Netley and England.

The medical service of the army consists of three bodies, viz., the Army Medical Staff, composed of physicians and surgeons commissioned in the army. These officers are responsible for the working of the medical and sanitary service of the army, command the medical corps, and are governed by a Director General who belongs to the War Office Staff. There is also a Medical Corps of some 2200 hospital attendants trained to nursing and ambulance

duties. This corps has a training school at Aldershot, where the rank and file are instructed in all ambulance and medical duties. Finally, there is the Female Nursing Service, a limited body of ladies serving in some of the larger military hospitals. The Nursing Service has a Superintendent who is its responsible head under the Director General of the Medical Service. She is stationed at the Royal Victoria Hospital, Netley, Hants.

Turning from the regular army to the auxiliary services, we find our large Militia force completely defective in ambulance and medical arrangements, and it is now proposed that a body of militia, some 1200 men, should be trained annually in ambulance drill so as to form a supplementary help for the army in time of war, and this will be highly advantageous to the country.

Our large volunteer army 200,000 strong, is completely unprovided with bearer companies or field hospitals, and has nothing but some regimental help. There are probably not half a dozen ambulance waggons with the whole volunteer force. Public opinion is now being awakened on this head, and it is hoped that a battalion of medical volunteers will be raised in London, Yorkshire, and Lancashire, and that companies capable of forming field hospitals and bearer companies, will be formed in each English and Scottish county, and in many large towns.

It is a great pity the volunteer army is not made completely efficient from an ambulance point of view.

The ambulance service of the military force of this country must be looked upon as completely in a stage of development. The *matériel*, or the waggons and equipment of the bearer companies and the field hospitals, are singularly heavy, cumbrous and unsuited to our varying wars. No complete standard equipment of a field hospital to be carried on mules exists either in this country or in India. Concerning ambulance railway carriage and its development there is still much to learn. It will be useful to note any foreign equipment sent to this Exhibition, and to copy its good points. Field cooking as

now generally provided for in the armies by special portable cooking waggons is also a subject needing much development.

So far as concerns the ambulance *personnel*, an English war hospital for 200 sick is completely undermanned, and it is impossible to make it work efficiently with the small number (thirty-seven) of men supplied to it.

No provision whatever is made for water carriers, washermen or sanitary police, and as a consequence great difficulties arise in war time. It is entirely to the advantage of the country and its soldiers that public opinion should understand what ambulance aid means, so that real field efficiency may ever follow our military ambulance arrangements. The more the ambulance arrangements of the army, the militia, the volunteers, and the red cross societies are developed in England the better will it be for that private soldier on whom in all our wars the heaviest sufferings from ambulance shortcomings fall. All who desire to study further English war medical arrangements should purchase the 'Army Medical Regulations,' to be obtained from any military booksellers, such as Messrs. Clowes

CHAPTER III.

VOLUNTEER WAR AID.

THE KNIGHTLY ORDERS AND THE RED CROSS SOCIETIES.

The Knightly Orders and their work—The United States Sanitary Commission—The foundation of the Red Cross Movement—The Geneva Convention—The good and the weak points of the movement—Little help given to the English Army by Red Cross Societies—The work that might be done by the English Red Cross Society—The Johannritter Order of Germany—The “Deutsche Ritter” Order—The Austrian Maltese Order—The Italian Branch of the Knights of St. John—The English Order of the Knights of St. John—The Addresses of the Head Quarters of the European Red Cross Societies—The Periodical Press of the Red Cross—Gustave Moynier’s “Red Cross and its Future.”

THE different conditions of an army in peace and in war, as regards the needs of ambulance aid, are so marked that it can easily be seen how great must be the reserve help capable of being called out in war time over ordinary peace needs.

War is an epidemic of injuries and special diseases occurring amongst men who in peace time are little exposed to either conditions.

To maintain permanently the establishments suitable for medical war needs in peace would be impossible, and a reserve system capable of being called out for a campaign is the real need of all ambulance services.

Private humanity has never failed in all our wars to endeavour to mitigate the sufferings of the sick and wounded.

We may presume that it has always been so in the world in greater or less degree.

The spirit that in the crusading time founded the great hospitaller knights orders, was doubtless the humane effort of noble hearts who bled to think of the sufferings of the pilgrims and crusaders on their trying expeditions to the Holy Land. These orders were truly the forerunners of the great red cross movement of our own times.

They commenced, doubtless, in small beginnings, and were poor and weak at one time, but gradually they gained strength and power, and with it came a fading away of that great spirit of self-sacrifice which first gave them birth. Their rich estates and noble commanderies once spread over Europe, but to-day it is only in Austria that the endowment of the orders survives to any extent.

With the decay of the crusading spirit their hospitaller duties passed away, and they really became military knightly orders.

Reformations and revolutions swept away their property in many countries, and what survived of the knights seem to have become intensely narrow, and absurdly aristocratic, and exclusive in their organization, and forgot altogether the object which first brought them into existence. The red cross movement of our own day has been like some great democratic wave which has stricken down the barriers, and both the orders themselves and the world in general have been benefited by the flood of enthusiasm it developed. Private humanity did much for our army in the Crimean campaign in supplying money for the purchase of comforts for the suffering, and it would have done still more had it but known how to do it.

Probably the greatest outcome of national sympathy with suffering ever seen in this world was the work of the United States Sanitary Commission during the war of the rebellion in America, 1861-65. Its stupendous efforts and magnificent results will remain through all the ages as a landmark of humanity acting in its best form to relieve suffering. The story of its work in aiding the regular medical service of the United States army, the new departures it made in hospital comfort and organization,

the many-sided developments it has produced in reducing war suffering, will never be forgotten.

Immediately before the American war, another campaign had occurred in which much misery had been endured by the wounded. This was the Italian campaign of 1859. But out of its great horrors, and out of the depths of its sufferings, came refuge at last, and a better future dawned upon the world.

If one is asked to propose a saint for canonisation and to name in his honour a new order, let the saint be St. Henri Dunant, and let the order be called the Dunantines.

It is to Henri Dunant the world owes the origin of the red cross movement.

Horror-stricken by what he saw, he published a book called 'Un Souvenir de Solferino,' detailing the sufferings of the wounded in the Italian campaign of 1859, and as a result of his work a committee was held to discuss the subject of the treatment of the wounded in war, at Geneva, on the 9th of February, 1863, which led up to an International Conference at the same place in October 1863. The 9th of February, 1863, may be looked upon as the date of origin of this never-to-be-forgotten movement, which has for its aim the mitigation of suffering in war, and the provision of suitable aid for the sick and wounded in the field. The International Conference drew up a series of resolutions and recommendations, bearing upon the need of volunteer assistance to supplement the official help given to the wounded in war. It also recommended the neutralisation of the medical corps and all its attachés, civil, volunteer or military. It also founded a distinctive badge, the "red cross," on a white ground, and recommended it to be borne by all the medical corps, *personnel* and *matériel* of every class and kind.

This International Conference led the way to the drawing up of the "Geneva Convention," signed on the 22nd of October, 1864, by the accredited representatives of the leading European nations.

By it the contracting nations agreed to the neutralisation of the medical corps, and the hospitals and their attachés, and also of civil inhabitants aiding or sheltering the wounded. It recognised the Convention flag, but it in no way specially recognised red cross societies as such. In 1868 and in 1874 some further suggestions were put forward as additions to these principles, but they have not been ratified.

The Red Cross Societies exist now in every European and many other extra European countries ; they have, however, no official *international* recognition. The distribution of their badges is still *officially* subject in each country to military supervision. There are still *National* Societies subordinated to the military authorities of their own country. They have of course their centre for administrative and consultative purposes at Geneva, but this Central Committee has no official recognition. These National Societies have done an enormous good to humanity, directly and indirectly. They have, by their direct action, supplied for the sick and wounded an immense amount of assistance, both in *personnel* and *matériel*, and have been the great channel for national charity, and they have indirectly stimulated to a very great degree the slower moving state-controlled action of the official military, and medical authorities. In many countries their *personnel* is more numerous, and their *matériel* more complete, than that of the official medical services, and being freer to move, and being more influenced by public opinion, they have pushed forward ambulance assistance in a very marked degree. The stimulus they have given to the official medical services has been almost all for the best, although, as in many movements, there are weak points to be indicated.

The general outline of the organization is as follows :— At Geneva there is an International Committee keeping up communication with all the National Societies, and publishing a paper quarterly as a circulating agent between the different countries.

In each country there is but a single Red Cross Committee representing the whole national organization. In some

countries there is distinct official connection between the societies and the military authorities, in others this is not the case. Money is collected, ambulance *personnel* and *matériel* collected and trained, and the agents of the Red Cross during each campaign hasten to the scene of action, and endeavour to give what aid they can by money, men, or advice.

Of course in a movement of this kind adverse criticism is also heard.

The distribution of the Red Cross has in many instances been carelessly done ; unfit men and unfit women have at times received it, and a crowd of mere idlers have used it for a screen for their idleness. Swarms of *blasé* men have, under the protection of the Cross, to which they had no claim whatever, haunted the battle-fields, and under the guise of giving ambulance aid, have merely gratified a morbid curiosity. Numbers of "wild women," without discipline, without organization, owing allegiance to no chief, have flocked to the armies in the field, to encumber and obstruct the real workers, and to degrade by their extraordinary freaks the noble intentions of the founders of the League of the Red Cross. But, after all, these weaknesses in the movement have been few, and the good achieved has quite overbalanced them. What we need for our assistance in war is trained and disciplined help, come from what source it may. Scratch-teams of sensation-loving men and women we do not need in war. We need to have drilled and disciplined Red Cross volunteers, chosen calmly in peace, medically examined as to physique, morally examined as to character, enrolled with regularity and commissioned in due form, called out at intervals for inspection, and liable to expulsion for breaches of discipline.

Instead of a mere arm-badge, these societies need a complete uniform, not to be worn save by authority, and their documents and their defaulter sheets should be ready to be produced. Then, indeed, such societies of nurses, attendants or officers, would be of value ; but we must have discipline, exact, distinct, and unquestioned.

For us, in the English army, Red Cross aid has as yet

done little ; our hard campaigns in Ashanti jungles, in New Zealand fern thickets, in the cholera-haunted defiles of Affghanistan hills, or on the burning shores of the Soudan, have not attracted the followers of the Red Cross Societies.

We are the one army in Europe which has to trust almost entirely to our official medical service, and hence the need of its being strong and efficient ; hence the need of it having its own trained disciplined and entirely available official reserves. But we still should hold out a ready hand to all well-organized Red Cross aid, provided only it be disciplined, and that we can see it, and inspect it, and test it in peace for war.

What the mission of the English Red Cross Society (National aid to sick and wounded in War) should be, is to stimulate popular feeling by publishing pamphlets, giving prizes for essays on subjects connected with war-hospital work, by purchasing and exhibiting new patterns of ambulance *matériel* ; by enrolling, drilling, clothing and disciplining volunteer ambulance companies ; by granting money to purchase extra comforts for the sick in war ; by continuing its good work of organizing female nursing services on disciplined basis capable of assisting us in our war work ; by forming in London an Institute, where war medical equipment could be exhibited, lectures given, and discussions held on war-aid questions, and perhaps by founding a medal of honour for those who did good service in its cause. The Society should be a living force, influencing for good all popular opinion, and aiding us in the official medical service by teaching us and the world what our true needs are. The need of an English Red Cross Journal is very great indeed. The Red Cross movement may then be summed up as the outcome of a desire on the part of the peoples to mitigate in every way the suffering of the sick and wounded in war time. It is an uprising of human sympathy against the coldness and want of energy of official organizations. In every country in Europe, and in many foreign states, it has collected money, men and material—all for service in this good work.

The initiative of Henri Dunant has been taken up far and wide through the world, and the seed he has sown is bearing everywhere good fruit. These societies, beginning in voluntary effort, will gradually become more and more completely identified with the national forces of each country, and eventually, as a result of their labour, the official medical service will become more and more efficient. Such reformatations and such developments are bound to occur from time to time in the world, and we should gladly accept the good work done by them. The Red Cross movement will in future ages mark most distinctly the period in which we live.

The following are the names of some of the Knightly Orders aiding the wounded, and the addresses of the various Red Cross European Societies.

A. *The Johannritter Order of Germany.*—The German section of the Knights of the Order of St. John of Jerusalem, a highly aristocratic Evangelistic Protestant organization, occupies a very prominent position amongst German aid-organizations. The Order of St. John had existed in Germany as a Brandenburg branch for many centuries, and was remodelled in 1812, as a Royal Order, but apparently the revival of its war-aid work is of quite recent date. To-day it holds in Germany proper the chief position as the central organizing body, through which the German Imperial authorities deal with the various aid societies of the different countries in the German Empire.

B. *The Maltese Knightly Order of Germany.*—This Order is the Roman Catholic division of the same Order. It apparently works on the same lines as the Johannritter Order.

C. *The Austrian Order called "The Deutsche Ritter," or Teutonic Order (Catholic).*—This Order has long been in the field at aid work, and occupied the ground in Austria from mediæval times, and long before the Red Cross movement. It has a distinct agreement with the State as to its duties, and its ambulance-waggon and its *matériel*, which are found in each division of the army, seem very complete. It divides its war work in a definite manner

with the Austrian Red Cross Society. It apparently has no *personnel*, only *matériel*.

D. The "*Souveranen Malteser Ritter Ordens Grosspriorat von Böhmen*," or *Austrian Langue of the Sovereign Order of the Knights of St. John*, seems to be a powerful and wealthy military Order, furnishing complete trains of railway ambulance, transport, and field *matériel* to the Austrian army. It provides surgeons, attendants, and the knights themselves also take the field. Its railway ambulance trains, organized by Dr. Baron Mundy, are the most complete in Europe. The Order seems to possess large estates in different parts of the Austrian Empire, having probably escaped the confiscations which reformatations or revolutions have brought about in other countries.

E. In Italy the Knights of St. John seem to be useful and active, and in Spain particularly so, working there in direct unison with the Red Cross Society of Spain.

In England the Order of St. John of Jerusalem is not very active in war work, and is more known by its modern civil offshoot, the St. John's Ambulance Association, of which more by-and-bye.

The English Order of St. John (Protestant) has its headquarters at St. John's Gate, Clerkenwell, London, E.C. There is also a Catholic branch of the Order of St. John in England, but it does no war service.

F. The principal Red Cross Societies are as follows :—

International Committee at Geneva.—Rue de l'Athénée No. 3, Genève (Suisse). President, Gustave Moynier.

Central German Committee.—Wilhelmstrasse 73, Berlin.

Austria and Hungary.—Austrian Red Cross Society. Herrengasse 7, Vienna. Hungarian Society. Kettenbrückengasse 1, Buda-Pest.

Baden.—Comité Général de la Société Badoise de Secours. Herrenstrasse 45, Carlsruhe.

Bavaria.—Comité Central de la Société Bavaroise pour les soins et l'assistance à fournir aux militaires blessés. Munich.

Belgium.—Comité Central Belge. Rue Royale 42, Brussels.

Denmark.—Buloswei 24, Copenhagen.

Spain.—Association espagnole de la Croix Rouge. Plazuela del Humilladero 6, Madrid.

France.—Société française de Secours aux militaires blessés. Rue Matignon, 19, Paris.

England.—National Aid Society to Sick and Wounded in War. 5, York Buildings, Adelphi, London.

United States, America.—American Red Cross Society, Washington.

Greece.—Société grecque de Secours aux blessés. Athènes.

Italy.—Central Italian Committee of the Red Cross. Palazzo Lantè, Piazza Capellari 70, Rome.

Holland.—Comité Centrale de la Société Néerlandaise de la Croix Rouge. The Hague.

Prussia.—As for Germany.

Russia.—Comité Central russe de la Croix Rouge. Rue des Ingénieurs 9, St. Pétersbourg.

Saxony.—Comité Central des Secours aux militaires blessés. Dresden.

Switzerland.—Société Central suisse de la Croix Rouge. Zurich.

Periodical Press of the Red Cross :—

1. "Kriegerheil," organ of the German Societies ; monthly at Berlin.

2. "Messenger of the Russian Society." Weekly at St. Petersburg.

3. "Caridad en la Guerra." Madrid ; monthly.

4. "Military Medical Journal." Stockholm.

5. "Philanthrop." Organ of the Swiss Society ; Zurich.

6. "Bulletin International des Sociétés de la Croix Rouge." Organ of the International Committee, and published at Geneva ; quarterly.

Those who desire to learn more about the Red Cross Societies should read Gustave Moynier's "Red Cross and its Future," of which Mr. John Furley has made a translation, which is published by Cassell, Petter, Galpin & Co. London.

CHAPTER IV.

CIVIL OR PEACE AMBULANCE ARRANGEMENTS.

The Ambulance arrangements in American Cities—Need of the same in England—The treatment of Drunken men in the streets—Street Stretcher-lockers—A London Ambulance Service—Railway Ambulance arrangements—Poor Law arrangements—Example of a Municipal Ambulance System—The Metropolitan Asylums Board and its work—The Hospitals and Ambulance arrangements—The old Parochial System and its defects—The Ambulance Steamer “Red Cross” on the River Thames—Rural Ambulance Systems—The Battle District of Sussex—Lady Brassey’s System—The Town of Brighouse in Yorkshire—Civil Ambulance Societies—The St. John’s Ambulance Association and its work—The good done by it—The London Ambulance Service—The St. Andrew’s Ambulance Association—The Samaritan Society of Kiel.

WE have in a previous page of this Manual pointed out that it was mainly owing to the developments of war-ambulance systems that civil arrangements have sprung up.

The striking effects of a great battle, and its consequent miseries to the wounded, have ever arrested public attention in a manner that the more scattered accidents and sufferings of civil life have failed to do.

Yet when we remember our long-continued industrial warfare, with its daily casualties, and the vast sickness of our civil population, it will be understood how far greater are our civil ambulance needs.

On this point, as on many others, the people want light. Until the average citizen knows what a compound fracture is ; how arteries bleed, and why ; and understand some of the risks and pains attending the movement of cardiac or dropsical patients, great developments will not come. It is to the great cities of the New World, like New York,

Boston or Chicago, we have to turn to learn lessons as to civil ambulance arrangements.

We find in these cities regular ambulance conveyances, and a special staff of surgeons, attendants, drivers and horses, attached to the great municipal hospitals. The great central thoroughfares, the police stations, and the hospitals, are all united by telegraphic or telephonic communications.

At once on the occurrence of a street accident, a telephonic message is despatched to the District Hospital for aid, and, as a rule, in three minutes after the message is received, a specially constructed ambulance carriage, containing a medical official, with appliances and restoratives, is speeding on its way to render aid to the sufferer. The New York system is singularly perfect, and Boston and Chicago are not far behind. When we remember the vast numbers of persons run over and injured by carriage accidents, fall from scaffoldings, or stricken down by the many risks of our great factories, we all must admit that England generally, and our great cities in particular, need such organization of help almost more than America.

To stimulate all this humane work, what is needed is light. Every one rushes to aid in an accident ; but, alas ! the people do not know how to give aid, they know not what to do, or what not to do ; and so it is that injuries, in themselves light, are gravely complicated by ignorant handling. How needful then is it that we teach the people, and that we by so doing sow the seed for the development of ambulance-organizations !

The removal also of people suffering from heart-disease, rheumatic affections, infectious disease, dropsies, is also a subject of great importance, and it would be possible to tell many painful stories of the suffering caused by the absence of suitable stretchers and carriages for use in such cases.

Take, again, the question of drunkenness in our streets. Can anything be more degrading to human nature than to see a body of policemen struggling with a man in the mad stage of drink-poisoning ? The struggles of a drunken man in his excitement are as surely the symptoms of poisoning, as

the muscular cramps of strychnine poison mark the action of that deadly drug. The treatment in one case should be as carefully guarded as in the other ; yet have we not seen the murderous and cruel "frog's march" practised on drunken men, where the poisoned sufferer is carried with his head within a few inches of the ground, and all the blood of his body gravitating towards it. How many cases of police-cell apoplexy have really been murders, from ignorance from want of organization and education on this head ?

The day will most surely come when such sights will be no more seen. The stretchers so needed for these cases will not be found in police offices only ; but in every street of our cities red-painted lockers, like enlarged post-boxes, will contain a stretcher ready for use. Every policeman or local householder will have a key.

Every post-office will have such a stretcher, every railway station in the country ; and shall we say every public house also, so that they who sell the poison may also keep on hand a physical relief for its effects ?

A drunken man shall then be at once overpowered and strapped on the stretcher, and so borne to the hospital or police ward told off for such cases.

Nay more, we shall one day have municipal ambulance (sick transport) waggons attached to our great hospitals, or to special ambulance stations, and these waggons shall receive both accident cases or drunkenness cases on the stretcher as they are, and so place them in the waggon and drive them rapidly to the relief centre. It is only in this way we can free our streets from painful and degrading sights, and at the same time provide for accident cases.

London and every city should be mapped out in districts, and these districts allotted for ambulance-purposes to the local hospitals and the local police centres.

Telephonic communication should run from the streets to the hospitals and the police depôts, and at the hospitals the waggons or carriages should stand ready for constant use to drive to the scene of the accident. Trained medical

officials should be on duty, ready to leave with each carriage and to assist the injured person. The stretcher in the carriage should be interchangeable with the one in the street-stretcher-locker, and should replace it at once, receiving in return the sufferer and the other stretcher.

For the carriage of the sick, and those enfeebled and handicapped by disease, a special arrangement is needed, which only a strong municipal government will ever be able to organize.

The London Hospitals should come under a central Board, and their funds be "pooled" in a common fund, having in reserve the municipal rates to fall back upon.

The existing hospitals, and the many other municipal hospitals needed, should be distributed with system over our great city. A chain of outposts in the shape of municipal dispensaries should bring medical relief within a quarter of a mile of every citizen. Here first aid should be ever ready, and here the outpatients now swarming and crowding at our great hospitals should be dealt with in detail and by districts. At certain hours in the morning, midday, and evening, the sick-transport waggons from the great central hospitals should call at these outlying dispensaries, and carry in comfort the cases chosen for admission to the district central hospital. But far more than this is needed, for a ring of great hospitals, combining in the same extensive grounds both convalescent and treating sections, should surround London at a distance far removed from the smoke and overcrowding of our great city. Alike on the Sussex coast, on the Surrey hills, or mid the heaths of Berkshire, should be found those great outlying, overflow convalescent and treating municipal hospitals, to which, according to the nature of the case, each patient could be forwarded, but how? By special ambulance railway trains, leaving every morning with sick and returning every afternoon with the recovered. These trains, well fitted for every ailing case, will one day be as common as the sleeping-cars of the Pullman trains are becoming common, and an inestimable boon they will be to all using them.

And this leads me to the subject of railway-ambulance arrangements, now so completely defective. First, (*a*) every railway porter should be taught the elements of ambulance aid, in lifting injured persons. It is easily learnt.

(*b*) Every railway station needs a carrying chair, for carrying invalid travellers from their conveyances to the carriages.

(*c*) A stretcher should be kept by order in every railway station throughout the length and breadth of the land, ready for use.

(*d*) In the guard's-van of every train of every class, such a stretcher should be kept folded up and put away, but ready for use, and iron clamp stanchions, after the "Hamburgh system" (to be described afterwards), kept ready also for suspending the stretchers.

(*e*) To all breakdown trains should be added proper ambulance carriages, fitted up for the conveyance of those maimed in our railway accidents, and similar carriages should be available for passengers, if needed, at fair rates. Charitable societies might well supply the carriages and keep them in order. This would be really practical humanity.

In country districts the Poor Law unions furnish a ready machinery for ambulance aid. At every central union hospital, ambulance carriages, both for sickness and for infectious disease, should be kept; and in all the outlying parishes, stretchers and smaller-wheeled ambulances. Telephone communication would connect the outlying districts with the central hospital. Examples will be given further on of all these systems.

In mining districts and in all our great factories, stretchers should be kept by the owner, and either hand-wheeled ambulances or horsed-carriages be available for aid. The absolute saving of money to the world by preventing a simple fracture becoming compound, would well pay for all appliances a hundred times over.

On our rivers and harbours, ambulance launches and steamers, specially constructed for the injured or the sick,

should be placed by the Local Board responsible for the sanitary police of the river.

We will now describe with more detail some of the existing systems of civil ambulance arrangements.

MUNICIPAL AMBULANCE SYSTEMS.

Arrangements of the Metropolitan Asylums Board, London.

Vide Plan, Fig. 4.

The Metropolitan Asylums Board of London has now at work in the Metropolis a system of ambulance arrangements well worth studying.

This Board, amongst other important duties, is responsible for the medical care and hospital accommodation of all cases of infectious disease occurring amongst the pauper class in greater London.

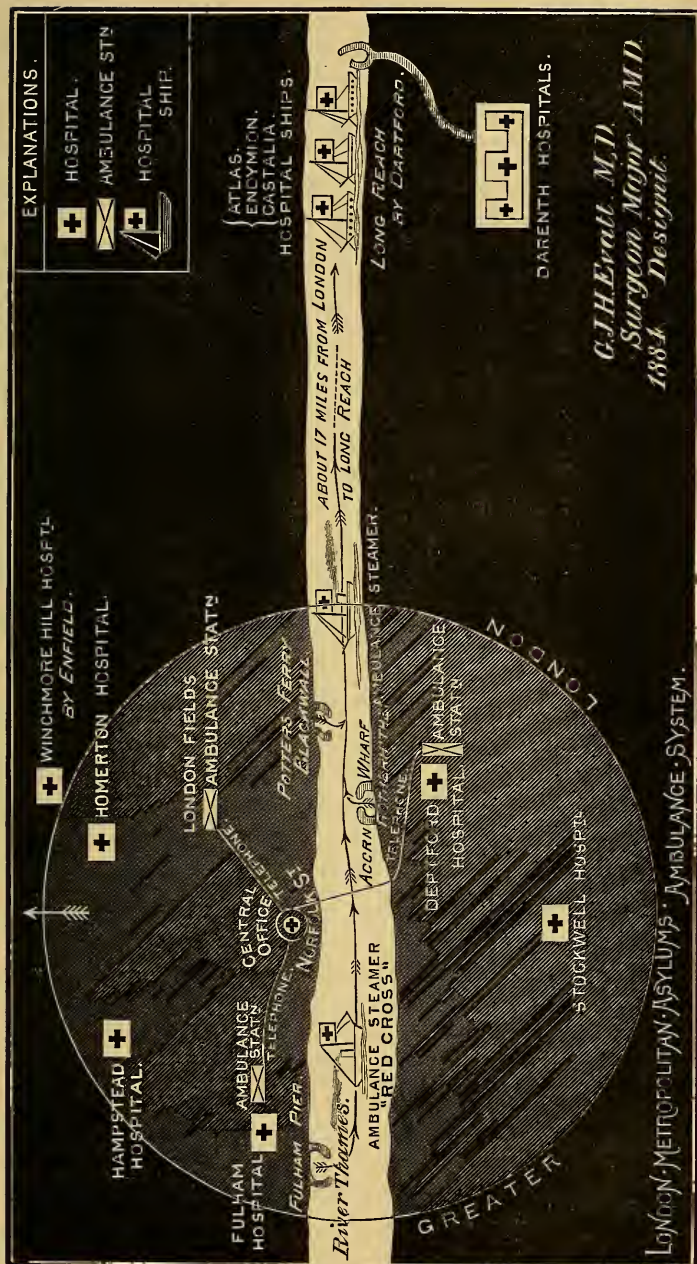
Its schemes of work are yet in the stage of development, and not completely worked out, but they may be explained in general terms, and the lines of work broadly indicated.

Previous to the formation of this Board, the various parishes dealt or did not deal with their own infectious cases. The Metropolitan Asylums Board have now in greater London five infectious disease hospitals. (Vide plan, Fig. 4), viz.: Hampstead, Homerton, Fulham, Deptford, and Stockwell. In these central hospitals the pauper sick of the districts are received up to a certain number, and with special reference to the class of cases. Practically these central hospitals are for grave acute cases, which cannot stand the fatigue or risk of removal to the outlying hospitals, of which we shall speak directly.

A limited number, probably not more than fifty serious cases of small-pox, would be kept in these central district hospitals, and of fever cases a somewhat larger number, but no excessive number will ever remain in them.

Outside London proper, in the country districts and amidst healthy open surroundings, great overflow hospitals for the reception of mild, or convalescing, or convalescent cases, are or will be formed for fever at Winchmore Hill,

Fig. 4.



by Enfield; and for small-pox, in the three hospital ships, *Atlas*, *Endymion*, and *Castalia*, moored at Long Reach in the Thames River by Dartford and Purfleet, with a further reserve hospital on the shore at Darenth close by the hospital-ships' moorings.

This shore hospital at Darenth will be a great overflow hospital, available for first admission in case of an epidemic, and also as a convalescent hospital for ordinary cases in ordinary times.

To convey patients to these central and outlying hospitals the system is as follows:—

When a case of infectious disease occurs in a locality, the medical officer reports to the district relieving officer. This official telegraphs to the Central Asylums Board office, Norfolk Street, Strand. This office is connected by telephone with the ambulance stations existing and under construction at Deptford, London Fields, and Fulham.

These ambulance stations are admirably organized, and, so far as we have seen them, well worthy of study as patterns of ambulance stations.

A staff of superintendents, drivers, and subordinates are on duty in each station. Suitable (sick-transport) ambulance waggons for conveying infectious disease stand ever ready to be horsed. The horses are in stables close by, ready for hooking in. The whole disciplinary, sanitary, disinfecting, and precautionary organization of the station leaves nothing to be desired, and seem to us to be in every way a model worth copying. When one reads the ghastly record of the style of conveyances used only five or six years ago in London, to convey those unfortunate sufferers stricken with contagious disease to the proper hospitals, one rejoices beyond measure that so successful an effort has been made to render human misery less. Let us fancy the pauper sick of the Plumstead, Woolwich, and Charlton districts, who, up to 1877, when stricken with small-pox had to drive sometimes fifteen miles, sitting on a board, in a conveyance in which they could not lie down. These conveyances used for small-pox were never disinfected,

and stood in sheds with other carriages. Of Shoreditch we read, "In the small-pox cab the patient cannot lie down or even stretch his limbs;" of Marylebone, "The patient cannot lie down;" of Hampstead, "The patient must lie on the floor of the vehicle;" of Clerkenwell and Holborn, "The patient cannot lie down," "never disinfected." St. Pancras, "Patient cannot lie down." What comfort to know this wretched misery is now past and gone!

At these perfect ambulance stations, which we now possess, night and day, on the receipt of a telephone message from the central office, in three minutes a carriage starts for the infected house. As it leaves the gate, a nurse with a basket of restoratives in her hand steps in, and proceeds to the house to superintend the removal.

From the house the patients are taken, if grave cases, at once to the district hospitals. If they be of milder type, small-pox cases are carried to the river ambulance stations, which are or will be formed at Blackwall, Fulham, and Deptford.

At wharves at these stations the special ambulance steamers—one of which, *The Red Cross*, is now at work, and another is under construction—will convey the cases down the river to the hospital ships at Long Reach.

In detail, further on, we will describe the various *matériel* used in this work, but the general outline is as we have described. It will be seen at once that an identical system suitable for non-infectious ordinary disease can one day be developed in London. The existing hospitals will become receiving houses for grave cases and sudden illnesses; and round London, overflow hospitals, combining treatment and convalescence, will be founded. Ambulance sick-transport waggons will collect the sick from the districts for the London central hospitals, and regularly organized ambulance trains will convey the invalids who are relegated to the country outlying hospitals to their destination.

All that is needed to start this important work is a central municipal authority.

RURAL AMBULANCE SYSTEMS.

It will be easily understood that for country districts an ambulance system can easily be adopted to the present union organization.

Every centre of a union should have a sick-transport carriage for infectious disease, and another for non-infectious disease.

The various outlying parishes should be united to the central office of the union by telephone, and the carriages could then be despatched as needed to the various places.

Fig. 5.



AMBULANCE ORGANIZATION ROUND THE BATTLE DISTRICT OF SUSSEX.

For accidents and non-infectious cases, stretchers with wheeled appliances should be kept in each village, local police office, local post-office or other place, the stretcher fitting into the central sick-transport waggon, and being exchanged with the patient on it for the stretcher in the waggon, which would be returned to the place from whence the stretcher was taken.

The diagram shows the system on which Lady Brassey, a regular ambulance missionary, has organized the Battle district. The secretary dwells in the Battle centre, and the outlying parishes are organized in connection with it,

and supplied with ambulance *matériel*. Any day our Poor Law unions could be so organized, but to achieve it we should teach every guardian what a compound fracture means. Until this is understood, progress cannot come.

TOWN AND VILLAGE AMBULANCE ARRANGEMENTS.

As an example of good work done in towns and villages, we would mention the ambulance organization of Brighouse in Yorkshire. Here a branch of the St. John's Ambulance Association was formed, and, under an active secretary, the local police, firemen, and many inhabitants, have been trained in first aid to injuries. An ambulance institution has been founded, and we find the following *matériel* available on the spot. One-horse ambulance (sick-transport) carriage for four patients, four two-wheeled Ashford litters, seven stretchers, one police-stretcher for drunken cases, one hamper of appliances for dressing, books, bandages, and diagrams, and a wooden coach house for the ambulance (sick-transport) carriage. Is not this highly creditable? and why should it be an exceptional case?

CIVIL AMBULANCE SOCIETIES.

It is to the St. John's Ambulance Association (chief office, St. John's Gate, Clerkenwell, London, E.C.), that we owe in England a great debt of gratitude for its successful efforts to popularise ambulance and first-aid knowledge amongst the people. It is an offshoot of the Order of St. John of Jerusalem in England, and has for its object the giving of lectures and demonstrations of first-aid to the injured in accident cases, and the provision of ambulance *matériel* for use in accidents.

Medical men are employed to give a course of lectures in first-aid in accidents, and in nursing. A regular syllabus is laid down; an examiner is sent down to hold examinations, and on his report certificates of first-aid or nursing are issued to the successful candidates.

Ambulance *matériel* is supplied by this association to many hundred places in England ; but truly its important work is the education in the first principles of help it is giving to the people generally in all that concerns the human body. After considerable experience as an examiner, we can safely say that it has spread the first rays of the light of knowledge amongst thousands of people of every class, from the highest to the most humble in the land, and its work has been entirely for good. We feel quite certain that any medical man who takes up these classes in his town or village will be conferring a real benefit upon his district. Laymen of great intelligence and occupying prominent positions have frequently stated, that in any previous mistakes they made in giving help to sufferers, it was entirely their ignorance that was to blame. We have not taught the people enough, and it is to the credit of the St. John's Ambulance Association that they have fought the good fight, and victory is now theirs. To Colonel Duncan, Mr. John Furley, Mr. Barrington Kennett, and the hardworking secretary Captain Perrott, a national debt of gratitude is owing. Any further particulars as to formation of classes, method of work, and supply of ambulance *matériel*, can be had of the Secretary St. John's Ambulance Association, at St. John's Gate, Clerkenwell, E.C., London.

THE LONDON AMBULANCE SERVICE.

In 1882 a movement to start a "London Ambulance Service" was originated, and is now at work in a small way. H.R.H. the Duke of Cambridge is President of the Committee ; Mr. J. H. Crossman, Chairman ; and Mr. Haggard, Secretary London Hospital, is Honorary Secretary. It has for its aim the provision of ambulance sick-transport carriages for London by means of public subscriptions. It has already supplied Howard's pattern of sick-transport carriages to Stoke Newington Police Office, to Fulham Police Office, and also to Lambeth Police Station. A hand-

ambulance, covered in, and built on Howard's system, has also been supplied to Stepney Parish, and the Vicar informs us it has been of much use. In all cases where these ambulances are supplied, a minimum charge of 5s. is made, increasing with the distance to 10s.

It will be quite evident that the poor are completely unable to pay such a sum, and even many people of that struggling body who form the lower middle class. One would like to see some charitable or municipal funds pay all charges in these cases, so as to lower the cost to that of an ordinary cab—or to abolish it altogether. As far as one can find out, the very existence of the "London Ambulance Service" is unknown to most people, and the London hospitals have not joined in any way in the movement. Further information can be obtained from Mr. Haggard, Secretary London Hospital.

PROVINCIAL AMBULANCE ASSOCIATIONS.

There is an Ambulance Association at Glasgow called the St. Andrew's Ambulance Association. It works an arranging ambulance instruction for the people, and the provision of sick-transport waggons and *matériel* for the use of the public in cases of accidents or illness. Office, 93, West Regent Street, Glasgow; Mr. W. M. Cunningham, Secretary, who will afford any further information needed.

In Edinburgh some steps are being taken to form a similar Association.

CONTINENTAL CIVIL AID SOCIETIES.

Professor Esmarch, after studying the St. John's Ambulance Association system in England, has started a "Samaritan Society" on the same lines, with Kiel as its centre, from whence the movement is spreading over Germany.

Baron Mundy is the founder of a society on somewhat similar lines at Vienna.

CHAPTER V.

PERSONAL "FIRST-AID" EQUIPMENT.

The Surgical Havresack—Water Bottles—Field Companions—The Soldier's first Dressing—Means of carrying it—Identification Label—Esmarch Triangular Bandage—Esmarch's Braces.

THE difficulties of transport in war, and the sudden needs of "first-aid," in peace, renders it essential that a certain amount of *matériel*, in the shape of instruments and bandages, should be carried by the ambulance staff of an army, and by the individual fighting soldier himself in war time, and that in peace readily adopted means of aid should be more generally available. Thus in war, scabbards, bayonets, stirrup-leather, rifles and other articles are used as splints ; just as in peace, garden-palings, rolls of paper, and walking-sticks are utilised.

In our army every medical officer carries a case of instruments in a pouch worn over the left shoulder. With every battalion and battery, small portable medicine cases, called "Field Companions," are found. These contain compressed drugs, restoratives, bandages, and the materials needed in first dressings.

With the bearer companies a regular havresac, called the "Surgical Havresac," and containing bandages, restoratives, a simple dressing-case, and tourniquets, is found.

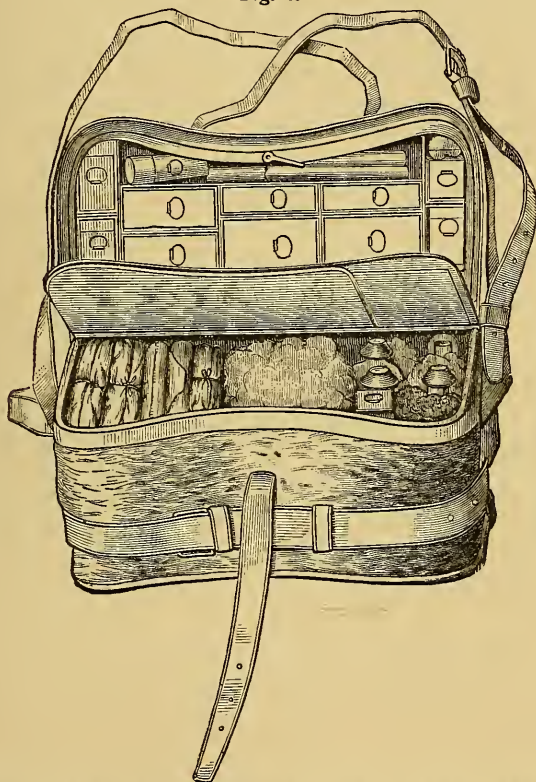
This valuable aid is only issued to one-fourth of the number of bearers ; but it should be issued to every one of all ranks in the bearer company, and each regimental bearer should likewise have one. They are made by Savory and Moore, of New Bond Street, and cost about £3 each.

Water-bottles are also carried in certain proportions by the bearers ; but we would like to see every bearer, without exception, so equipped.

The method of carrying the surgical havresac and water-bottles is shown in the picture on the title-page.

In Continental armies knapsacks containing very much the same *matériel* as is found in our "field companion" are much used, and for cavalry special saddle-bags (*sacoches*

Fig. 6.



FIELD COMPANION FOR PORTABLE DRUGS AND FIRST DRESSINGS.

(From Surgeon-General Longmore's Book, 'Gunshot Injuries'.)

d'ambulance) are issued containing like equipment. In our army the cavalry first-aid appliances of every kind are very defective, and it will be interesting to note foreign equipments of this kind sent to the Exhibition. In our army a certain number of the fighting soldiers carry a bandage and

some dressing, either in their havresac or in their pockets. This most important help to the wounded in war needs to be completely and definitely dealt with in our service. Unless a distinct pouch is made for these dressings, they will never be either clean or available. There is room on the waist-belt, between the ammunition-pouch and the bayonet-frog, on the left side for a very small leather pouch, about four inches in breadth by six in depth. Such a pouch, kept in store in peace, should be issued in war to every fighting-man. It would contain an Esmarch triangular bandage, a roller bandage, some lint, oiled silk, and such antiseptic dressing as may be desirable. All these articles would be pressed by force into a small bulk, and placed in a waterproof cover in the pouch, and with them the absolutely essential "identification label." This would be a calico label, like that used for marking luggage; and when the war began, it should be filled up with all the particulars of the man's name, number, and regiment, so as to avoid delays and mistakes made on the field when men are wounded and faint, and cannot speak distinctly, or indeed, at all, at times. It should have counterfoils to the slip for the regimental surgeon, the bearer-company adjutant, and the field-hospital adjutant. The surgeon should only have to fill up the particulars of the wound on the field, all else being filled up leisurely at the beginning of the campaign.

IDENTIFICATION LABEL TO BE CARRIED BY THE
SOLDIER IN THE BANDAGE POUCH.

Field Hospital Adjutant. (<i>Keep this.</i>)	Adjutant Bearer Company. (<i>Tear off.</i>)	Regt. Surgeon. (<i>Tear off.</i>)
REGT.—1st Battalion King's Own Borderers.	REGT.—1st Batt. K. O. B.	REGT.—1st Batt. K. O. B.
NO.—4239.	NO.—4239.	NO.—4239.
NAME.—Private Thomas Atkins.	NAME.—Pte. Thos. Atkins.	NAME.—Pte. Thos. Atkins.
WOUND.—	WOUND.—	WOUND.—
— day of —, 188—.		
Surgeon —.		

The label would be three times this size.

When hit, the regimental surgeon would fill up the main portion of the label, and tear off the regimental surgeon's slip for his own information. The adjutant of the bearer company would do the same with his slip, and thus fuller and clearer information would be obtained, and also the dead distinctly identified.

The Esmarch triangular bandage, now well known to ambulance students, should form part of all field-dressings ; it is so useful for slings and head-bandages.

Professor Esmarch has also invented a pair of braces

Fig. 7.



ESMARCH'S TRIANGULAR BANDAGE FOR FIELD DRESSING.

which can be used as an elastic tourniquet for stopping bleeding.

There will probably be further developments of this idea as time goes on, so that one day interchangeable articles suitable for ordinary life and for surgical aid may be common. It will be remembered that the existing crimson sash of infantry officers was originally introduced for use as a hammock to carry the wearer when wounded off the field.

As far as regards the uniform of the ambulance staff of the various European armies, it is possible that one day an

international medical dress may be decided upon by an international conference. There would be advantage if medical officers and their men could be recognised at once, no matter to what army they belonged. In this, as in many other points, the system of ambulance-aid in war is quite in a germ condition.

The uniform decided upon for ambulance wear should be easy, free, and rational, and free from all tightness and display. The dress of women who desire to serve in war hospitals should also be completely rational, and all extra articles needing washing reduced to a minimum. The present outdoor dress of army nurses is certainly not suited for war service.

CHAPTER VI.

*AMBULANCE SICK TRANSPORT APPLIANCES
CARRIED BY MEN.*

STRETCHERS, HAMMOCKS, DHOOLIES.

The Faris Stretcher—Baron Percy's Stretcher—An Ideal Stretcher—
Furley's Lowmoor Jacket—Hammocks—Dhoolies—Dandies—
Need of Stretchers in the Streets.

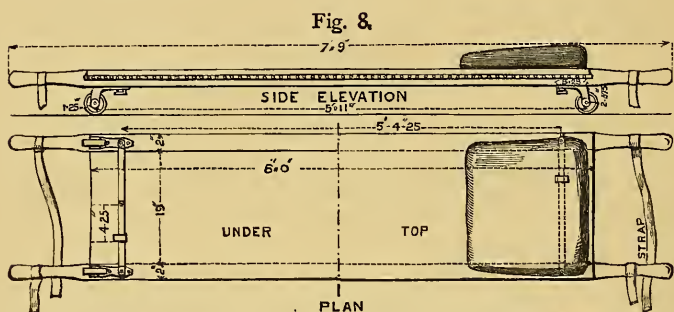
The one great essential in all ambulance aid is some means of carrying the injured person from the scene of his injury to the hospital. This is provided in the "stretcher," which consists practically of two side poles, and a sheet of canvas stretched between.

The "Early English" stretcher used in the Crimean campaign was simply of this pattern. There were two side poles kept apart, when open, by two iron rods called traverses, and a canvas sheet for the wounded man to lie upon. If the traverses were unhooked, the poles came together, and the stretcher could be rolled up into a small space. It had no legs, so that, if laid upon wet or stony ground, the canvas did not protect the patient, and there were no slings.

To the invention of stretchers there is literally no end. Their name is legion. Every modification of hinged and folding-up mechanism has been tried, some light and some heavy, and some mere curiosities of structure. It would be impossible to notice them farther.

The present regulation stretcher of the English army is known as "Surgeon-Major Faris's Stretcher." It is most solidly built, and consists of two side-poles of ash, brown

canvas bottom, a pillow, two self-locking traverses, which lock under the stretcher and keep it open. There are four wheels of *lignum vitæ*, on which the stretcher rolls into the ambulance waggon, and which act as legs when used as a camp bedstead, a use to which all army stretchers are liable. It weighs 32 lbs., and costs at the Royal Arsenal, Woolwich, about £3. Carter & Co., 47, Holborn Viaduct, London, can supply it at the same price.



ENGLISH ARMY REGULATION STRETCHER, 1884 (*Surgeon-Major Faris*).

To aid the bearers it has two leather slings, one at either end, which the bearers put over their neck like a milkman's yoke, and so relieve their arms of part of the weight.

Fig. 9 is a picture from Surgeon-General Longmore's book of a field stretcher, designed by Baron Percy, and the equipment of the stretcher-bearers themselves is also shown.

It will be seen that the stretcher, when not in use, is divided between two bearers, who, when it is to be used, rig it up by passing the poles through the wooden end-pieces carried over the knapsack, and put on the canvas bottom.

It would be absurd to think that we have in any way arrived at finality in our stretchers. We have little doubt that a stretcher will one day appear, to which the existing pattern will bear the relation of a country cart to a bicycle. The stretcher we may see will not be designed either by an

ambulance amateur or an official artillery carriage-builder, but rather by a skilled mechanical engineer, well acquainted

Fig. 9.



BARON PERCY'S STRETCHER ; BEARERS IN MARCHING ORDER.
(After Longmore.)

with steel and it uses, and knowing what is needed to be produced. The men who have built our spider's-webs, called

Fig. 10.

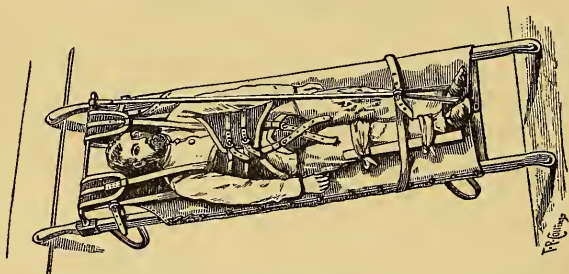


THE SAME, WITH STRETCHER FITTED FOR CARRYING WOUNDED.
(After Longmore.)

bicycles, must surely be able to construct a light and useful field stretcher. It should be so light as to be carried by one

man with ease when folded up; the side bars or poles should be of steel, so strong as not to yield if used as a camp bedstead. The canvas should be detachable, so as to be easily cleaned, and perhaps carried by the bearer, rolled up like a soldier's great-coat. The traverses should be light, yet strong enough to keep the sides firmly apart. The legs would need careful study, and all the parts should be completely interchangeable. The pillow need only be an empty case, buttoning up, and ready to be filled with hay or grass in the field. The leather slings could be replaced by light steel chains, so strong as to hold up the stretcher and the patient, if the stretcher was hung up in a luggage van for travelling. The weight should not be more than 15 to 20 lbs., if so much.

Fig. 11.



FURLEY'S "LOWMOOR JACKET," FOR USE IN MINING ACCIDENTS, ETC.

While writing of stretchers, we may here describe FURLEY'S LOWMOOR JACKET, which seems to be a singularly useful article. In the shafts of mines, sewers, and other narrow places, it is not possible to remove an injured person in the recumbent horizontal position.

Mr. Furley has designed a jacket which encircles the injured person's chest and abdomen, and which has strong back pieces which run up behind the patient's back, and cross over an iron bar, which is slipped by iron rings over the handles of the stretcher. There is also a strong support passing between the legs, and fastening to the jacket. The legs are kept in their place by a strap—and

additional support is given by a web-stirrup, into which the sound foot can be slipped if desired.

The patient can thus be drawn up vertically out of the mine or sewer, or lowered into a boat, without injury to the wounded part.

Extempore stretchers are made out of rifles and soldiers' great-coats, or the valise may be hung between two rifles and a kind of stretcher so improvised. A number of improvised seats for carrying injured men have been previously pictured—vide Fig. 2.

HAMMOCKS have been frequently used to carry injured persons. They are quite unsatisfactory for such a purpose, as the sides close in very much when slung, and they offer no secure resting-place in case of broken limbs. After the battle of the Alma, many of the wounded were carried to the shore in hammocks slung on oars; but this wretched makeshift is only permissible when, as on that occasion, regular ambulance arrangements were completely absent.

In mountainous countries various methods of carrying sick and wounded in baskets or chairs borne on the backs of mountaineers are in vogue. The patient faces to the rear, and sitting in the chair, is carried over the ground like an ordinary load.

In Eastern countries, where wheeled-carriages, owing to bad roads, cannot travel smoothly, there is an immense variety of means of human transport by bearers. Any one who has travelled in India will remember the many patterns of such conveyances that exist.

There is the Dhoolie, a closed-in litter, carried by four bearers, with two others as a relief. This highly commodious means of carriage has formed the staple sick-transport in all our Eastern wars. Carriage for 10 per cent. of an Indian army is generally allowed during a campaign, and this would imply some 600 bearers with a fighting battalion 1000 strong.

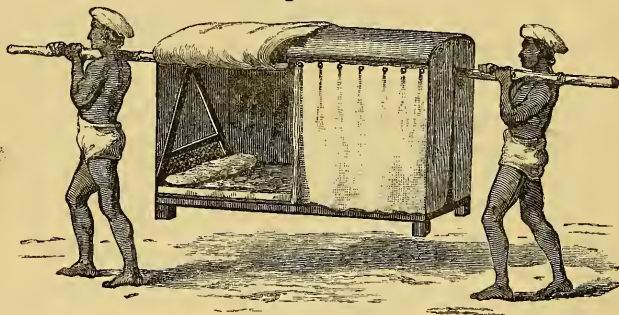
To-day in India the dhoolie-bearer class is gradually disappearing before the progress of railways and horse-conveyances, and it may be necessary as time goes on to

preserve the caste absolutely for military purposes, as around our Indian frontier wars are almost perpetual, and the dhoolie-bearer is much needed.

There are many modifications of the dhoolie in existence, and the number of new dhoolies invented is considerable. Surgeon-Major Bourke, of the Army Medical Department, has invented a dhoolie which fulfils many needs. It can be used as a stretcher, and a hospital bedstead as well as a dhoolie, and the poles and covers of a few dhoolies form also a tent for the sick.

The DANDY, a cot slung from a pole, and carried by two men, with two more as a relief, was much used in the

Fig. 12.



THE INDIAN DHOOLIE. (*After Longmore.*)

second Affghan war, and it will probably be as much utilised in future campaigns.

Dhoolie-bearers accustomed to the plains dhoolie carry the hill dandy with ease.

Palanquins and jhampanas are modifications of the dandy and dhoolie, types common in India.

We have in an earlier chapter recommended that stretchers should be kept in every street in our great cities, in a "stretcher-locker," of which the police and certain residents should have keys. Every railway station should also have one, also every guard's-van in all passenger trains. No public school, factory, institution, or asylum

should be without such aid in carrying injured people. Probably many chemists would be glad to keep such stretchers in their pharmacies, and exhibit a notice to that effect in their windows, if any philanthropic society would provide the article.

But in the end, municipal, parochial, or Poor Law district governing bodies will be made responsible for this important work.

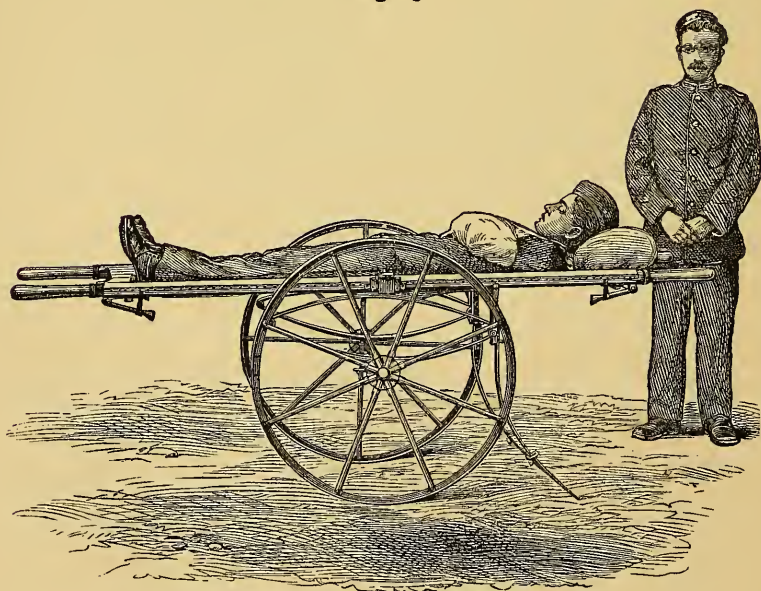
CHAPTER VII.

AMBULANCE SICK-TRANSPORT CONVEYANCES WHEELED
BY MEN.

English Military wheeled Stretcher—The Ashford Litter—Neuss Litter with wheeled support.

WITH the view of diminishing the number of bearers and attendants employed in transporting sick or injured persons, various patterns of wheeled-stretchers have been designed. They are mainly of use for civil purposes where

Fig. 13.



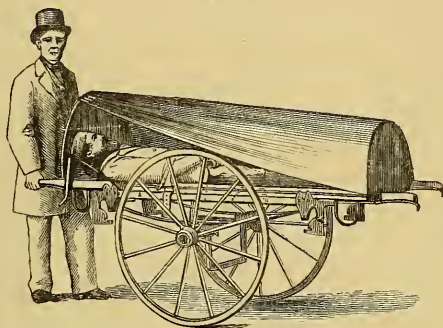
MILITARY STRETCHER ON WHEELED SUPPORT.
(From Surgeon-General Longmore's 'Gunshot Injuries.')

in cities or towns good level roads are available, and the jolting which would be caused by uneven tracks reduced to a minimum.

For military service a pattern of a wheeler stretcher is sealed. The stretcher is detachable from the wheeled support, and when loaded, one man can thus wheel one patient. In the field where battles have to be fought over every kind of broken ground, these stretchers are of little use, and no records exist of their being used to any extent in any army.

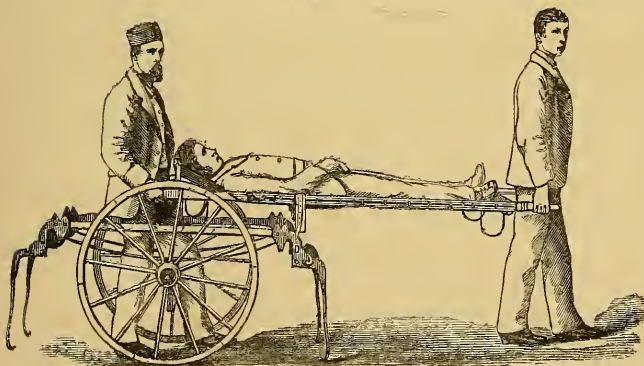
The Ashford litter consists of a folding stretcher with

Fig. 14.



FURLEY'S ASHFORD LITTER. THE STRETCHER, WITH COVER, PLACED ON THE WHEELED SUPPORT.

Fig. 15.



THE ASHFORD LITTER. THE STRETCHER DETACHED FROM THE WHEELED SUPPORT.

pillow and removable cover, resting without any fastening on four small iron crutches, with an under-carriage of two wheels on elliptical springs.

This litter has the advantage of a crank-axle, enabling the bearers to pass with the stretcher between the wheels, so that lifting over the wheels is avoided. The stretcher by itself costs two guineas, and the litter, complete, ten guineas. It can be obtained at the Director of Stores, St. John's Gate, Clerkenwell, London, E.C.

Fig. 16.



ST. JOHN AMBULANCE LITTER, COMPLETE ON WHEELED SUPPORT.

The St. John Ambulance Wheeled Litter. Price £16. Weight: complete litter, 1 cwt. 2 qrs. 14 lbs.; truck, separate, 3 qrs. 7 lbs.; litter, separate, 3 qrs. 7 lbs.

This litter is the invention of Messrs. Neuss, of Berlin, and was first employed by the Prussian *Johanniter Orden* (Knights of St. John), during the Franco-German War, where its practical advantages in alleviating suffering first became apparent. Considerable attention has been paid in the design of this litter to secure an easy and steady position for a patient while being transported in it. The patient does not lie in a completely horizontal posture; his head and back are somewhat raised, and inclined at an

angle with the pelvis and thighs. The head of the patient rests upon a pillow covered with glazed cloth or leather ; the back, pelvis, thighs, and legs upon a flexible support of painted sail-cloth. There are two padded supports for the arms and elbows of the patient. A folding sail-cloth hood is fixed to the upper end of the carriage, and can be drawn over the head and shoulders of the patient, so as to form a sun-

Fig. 17.



STRETCHER DETACHED.

shade or protection against rain, without interfering with the free access of air. A cover of sail-cloth is also rolled up, and fastened by two straps at the foot of the litter. This covering, when unrolled, can be drawn up so as to lie under the upper edge of the expanded hood, and be fastened to the upper part of it. By these means the patient, during transport, can be protected against dust or inclement weather on every side. Under the part which is made to support the head and shoulders of the patient there is a wooden receptacle capable of carrying refreshments, bandages, or other parcels, or of receiving any articles belonging to the injured man who may have to be transported to the hospital. To facilitate the litter being

carried upstairs, into the wards of an hospital, or into the narrow alleys of a town, the stretcher is made to be easily detached from the iron frame. When so detached, it is kept off the ground by four short iron legs, which are fixed to the side poles at the head and foot.

This litter can be obtained from the Assistant Secretary, Order of St. John, Clerkenwell, E.C.

Those who desire further information concerning wheeled litters should write to the firm of Lipowsky-Fischer (Manager: C. Maquet) of Heidelberg, for their copiously illustrated catalogue of ambulance equipment of various kinds. It contains a vast number of interesting ambulance and invalid-furniture illustrations.

CHAPTER VIII.

AMBULANCE EQUIPMENTS CARRIED BY MULES OR HORSES.

Need of good Mule Equipment for our varying wars—The English Medicine Panniers—Mule Cacolets—Mule Litters—Ideal Mule-loads for a Field Hospital.

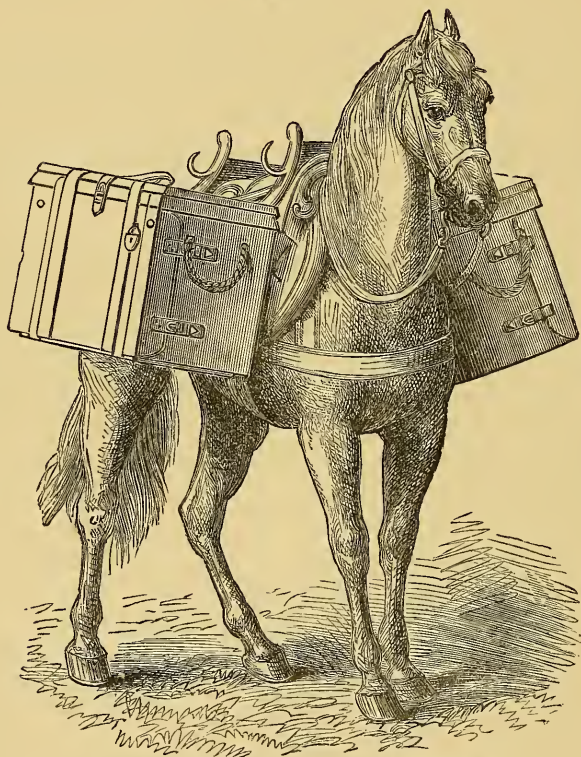
PACK-ANIMALS have always been much used with armies in the field. They can travel on any mountain path, and it is essential to have much of the *military* medical *matériel* of such description as can be carried easily in this manner. The English army is still deficient in good mule equipments from a medical point of view. We have no field hospital equipment regularly organized for mountain campaigns, or for countries which, if not mountainous, are not traversed by regular roads.

Practically if we once had a good mule-borne mountain hospital equipment it would almost completely equip us for our own little wars, for we have only to give a mule pannier to two coolies to carry in campaigns like Ashanti, or to hang two panniers over a mule as in Affghanistan, or to pack four panniers on a Maltese cart for a campaign like Egypt or the Soudan, and to stow away 8 or 12 mule panniers in a field waggon for any European war. If once we could so equip a 25-bed unit hospital, the difficulties of our many wars would be solved ; for, after all, a 200-bed hospital only needs eight 25 bed-units of equipment. We would need a pair of mule-panniers completely equipped as a cook-house load. Its pots, pans, and various utensils, complete for 25 men and the load itself, forming a distinct unit. We also need a 25-man clothing-load, viz. towels,

sheets ; and feeding-utensils, plates, knives, cups, salt-cellars, for 25 men. Eight such loads would equip a 200-bed hospital.

We also need an "office pannier," containing all the records, stationery books, forms used in war-time. The

Fig. 18.



MEDICINE PANNIERS CARRIED ON A MULE.

(From Surgeon-General Longmore's 'Gunshot Injuries'.)

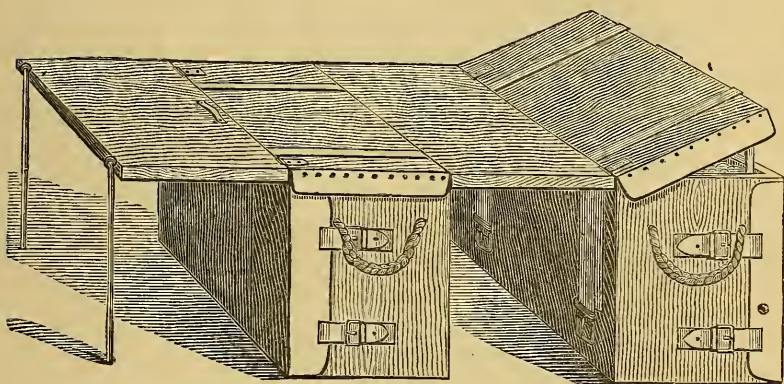
panniers themselves forming a writing table and a seat, as needed.

We also most urgently need a "Conservancy load," consisting of the picks, shovels, latrine-vessels, bed-pans, latrine screens—needed, and so urgently needed, by the sick in war time—the frame to form the latrine seats and to

enclose the vessels on the march. We also need a portable operating table of a simple kind, to be carried by a mule, and our loads of blankets, and waterproofs, could easily be made of suitable bulk for mule carriage, which is about 80 lbs. for each side box, or 160 lbs. to 180 lbs. for a mule.

It is hardly credible that in India, where we have been so long campaigning, that no defined field hospital mule equipments exist. The want of such equipments was much felt during the Affghan war. Towards the end of the same campaign, mule hospitals, as mobile as mountain batteries, were ready with the army, but they grew up under many

Fig. 19.



MULE PANNIERS ARRANGED TO FORM AN OPERATION TABLE.

(After Longmore.)

difficulties, as no code exists defining their correct organization.

The English medicine panniers for mule carriage are probably our best unit of medical equipment. They are carried on either side of a mule or pack-horse, and when placed on the ground form an operating table if opened out. They cost at Savory and Moore's, £48 10s. per pair.

These articles, which carry only medicines and dressing, should be the model of the unit of the future to which all our field equipments should be reduced. It could then be possible for the staff of a war hospital to carry their own

Fig. 20.

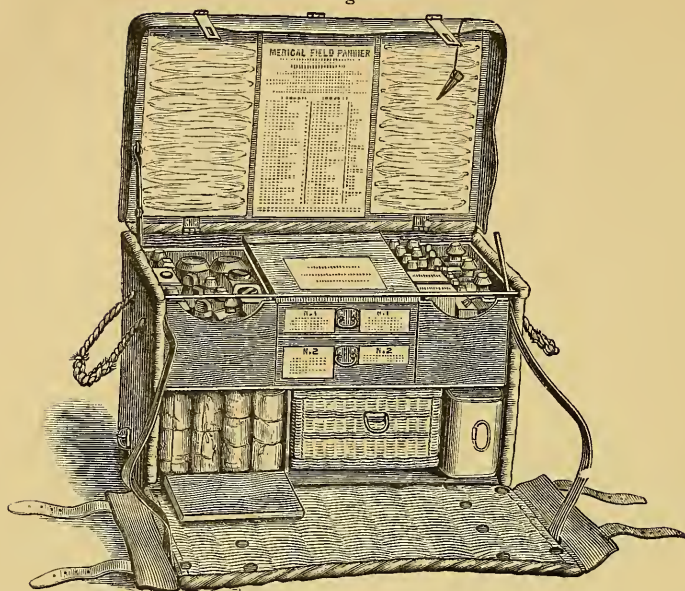
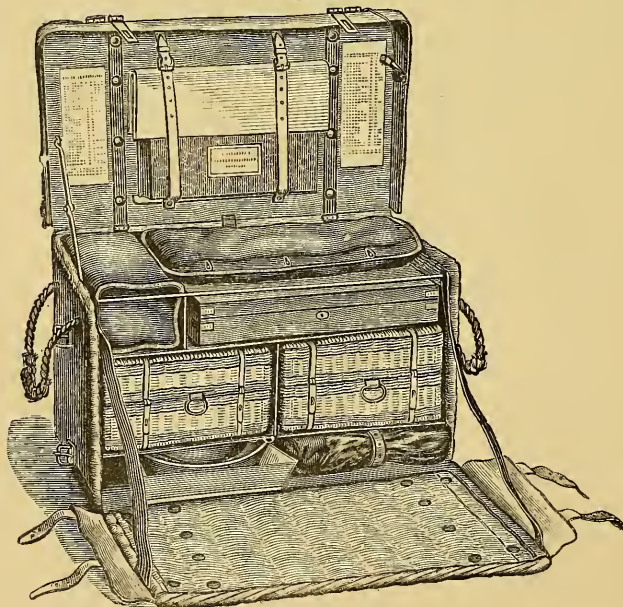


Fig. 21.



MULE PANNIERS OPEN TO SHOW CONTENTS. (After Longmore.)

equipment on board ship, with themselves, and so disembark in an enemy's country. To day our equipment is singularly cumbrous. Reduce it to mule units, and all will be well.

For the carriage of wounded two different mule equip-

Fig. 22.



MULE CACOLETS OR CHAIRS. (From Longmore's 'Gunshot Injuries'.)

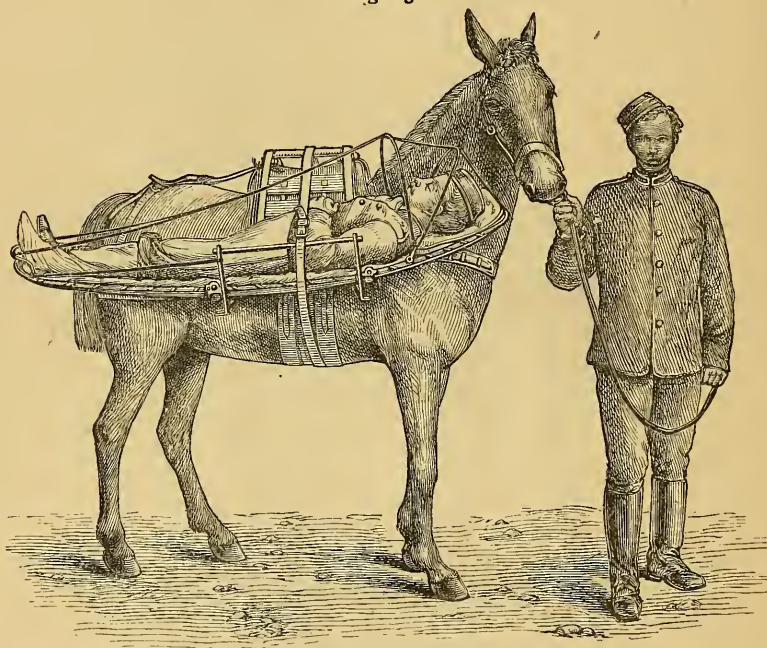
ments are used. Cacolets (*caque au lait*), copied from the Pyrenean dairy folk, are really slung chairs hooked on to a pack-saddle, and the wounded sit on either side of the animal. A pair of cacolets weigh about 56 lbs., and cost about £5 per pair.

The mule litter, or *litière*, is really a slung couch carried

on either side of a mule, and supports a person at full length lying down. A pair of litters empty weigh 106 lbs., and cost about £19.

Opinions differ as to the value of both those articles, and doubtless much depends on the training of the animal used. If the mules be unbroken, great risks occur to the

Fig. 23.



MULE LITTER WITH WOUNDED SOLDIER. (*After Longmore.*)

sick, and many men have been thrown out by a kicking animal.

During the recent Egyptian war a new departure was made in this branch of ambulance work, by utilising horses for this purpose, and it is to be hoped that trained cavalry horses will in future be largely utilised instead of mules for our cacolets and litters, leaving mules for pack-carriage proper.

Every regiment of cavalry in our army should have two

cacolets per troop regularly fitted to its troop-horses, and four or more litters for the regiment. At present our cavalry ambulance equipment is very defective, and it will be interesting to study foreign systems of help to wounded troopers.

If English mechanical genius could solve the problem of how to carry our severely wounded men lying at full length along the back of a horse, a great boon would be conferred on humanity.

There would be difficulty in achieving this arrangement, but it should not be impossible. Any one who desires to bestow a boon on an English army should offer a prize for the best cooking-appliances load capable of being carried by a mule, able to utilise wood as a fuel, and divided into two portions for either side of an animal, neither weighing beyond 80 or 90 lbs. It should carry all things needed for cooking for 100 men, or say 50 men on either side.

A "conservancy" load carrying all latrine arrangements would also be a real boon to the sick soldier. The other articles of nursing and feeding appliances are not difficult to stow away in any empty mule pannier-box that may be sealed as a pattern.

Water supply is always a difficulty in mountain campaigns, and for this purpose either small barrels are used, fitting on the pack-saddles of the mules, or large leather bags, called in India *puckalls*, are used. These are slung over the pack-saddles, and so water is carried. It is advisable to spread a tarpaulin over the saddle, to save it from damage by the water. A pair of iron tanks made to fit the mule-saddle, and made available in camp by adding a wheel and a pair of handles, might be utilised as hand water-barrows. All tents used for mountain campaigns should have their poles cut and socketed for use, so that in passing through defiles the ends may not catch against the rocks. In all that concerns mule equipment for warfare we have in the Indian mountain batteries singularly perfect models for us to copy. A more workmanlike unit does not exist in our English army.

CHAPTER IX.

CAMEL CARRIAGE.

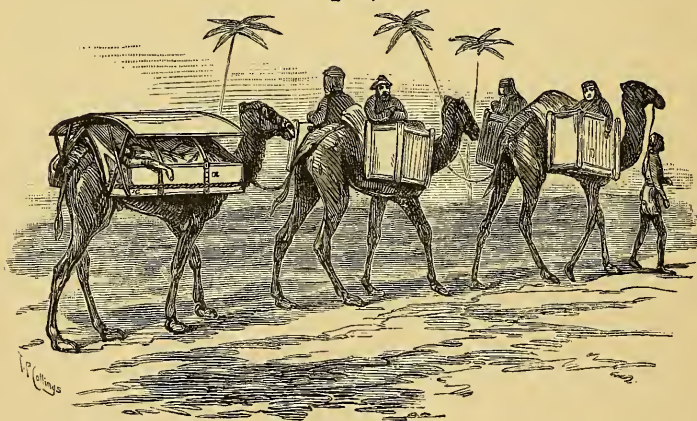
Camel Kadjawas— Bryce's Camel Dhoolie.

CAMELS are used throughout the whole of the East for the carriage of human beings as well as goods.

For the carriage of sick they have been utilised ; but they are not an agreeable means of travelling for a sick man.

In the Affghan campaign, several convoys of sick and

Fig. 24.



CONVOY OF SICK IN CAMEL KADJAWAS, AND IN BRYCE'S CAMEL DHOOLIE.
(After Longmore.)

wounded were sent down in camel *kadjawas*, but they are more useful for convalescent than for those actually sick. Here is a picture showing a camel convoy on the line of march, and one of the camels has a pair of Bryce's camel

dhoolies—an attempt at providing lying-down accommodation for a sick man on the line of march.

The fact is, no study has of late been given to devise suitable camel-carriage for the sick, and it is in an entirely primitive condition. It should not be impossible to devise a well-balanced camel-litter or dhoolie, in which a sick man could lie at full length, and which by some suspension system would counteract the swinging motion of the camel. When it is remembered that to carry two sick men in two dhoolies twelve bearers are needed, and that all their kit has to be separately provided for by other means of transport, and that if two or three bearers get sick, the whole gang break down, it is essential not to lose sight of some means of utilising camel-carriage for Eastern campaigns.

CHAPTER X.

WHEELED AMBULANCE EQUIPMENT AND SICK-TRANSPORT VEHICLES DRAWN BY HORSES.

Ambulance Equipment Waggon—The Surgery Waggon of the Bearer Company—The Pharmacy Waggon of the Field Hospital—The Store Waggon of the Field Hospital—The Kitchen Waggon of a Field Hospital—The Water Cart—The Laundry Waggon—The Electric Light Waggon—The Army Regulation Sick-transport Waggon—Its construction—The Austrian Red Cross Sick-transport Waggon—The United States Rucker plan of arrangements of Seats and Stretchers—Civil Ambulance Sick-transport Waggon—The Howard Sick-Transport Waggon—Davy's Ambulance Waggon—The Furley Sick-transport Waggon—The Atkinson-Philipson (Newcastle) Sick-transport Waggon—Infectious-disease Sick-transport Waggon.

IN all civilised countries where made roads are found, wheeled vehicles drawn by horses will always be the most important element in conveying aid to the injured, and in conveying the injured themselves to a place of shelter.

These wheeled vehicles divide themselves into two main classes : viz. ambulance *equipment* waggons, and ambulance *sick-transport* waggons ; the former being the conveyance used to carry the supplies, medicines and appliances needed for the relief of the sick, the outfit of the hospital, the medical stores, the water supply, the cooking arrangements, and all the various details of hospital interior economy ; while the ambulance sick-transport waggons are intended for the carriage of wounded or diseased men only. We shall deal with the ambulance *equipment* waggons first in order.

A. Ambulance equipment waggons.

The various waggons included under this head may be detailed as follows.

1. The Surgery Waggon of the Bearer Company.
2. The Pharmacy Waggon of the Field Hospital.
3. The Equipment Waggon of the Field Hospital.
4. The Kitchen Waggon of the Field Hospital.
5. The Water Cart of the Bearer Company and Field Hospital.
6. The Laundry Waggon of the Field Hospital.
7. The Electric Light Waggon of the Ambulance Column.

THE SURGERY WAGGON OF THE BEARER COMPANY.

If we were asked to say what vehicle in the medical corps of an army in the field is, after the ambulance sick-transport waggon, for the wounded soldier the most essential, we should say the surgery waggon of the bearer company.

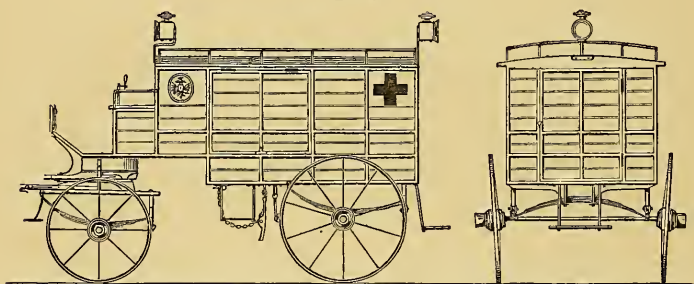
It is in this waggon that in all modern armies is carried those first essential articles of equipment needed to establish the all-important dressing station. These articles would be the operating tent to shelter the patient and the surgeons during the operations; the operating table itself, the surgical knives and bandages, the all-important cooking utensils for the life-saving soup, and such blankets as may be needed to shelter the wounded if they lie on the field at night.

The reader must remember the functions of the bearer company, and must study its position in the war diagram forming the frontispiece. It is to the bearer-company dressing-station all the divisional wounded are carried for further dressing and for food. If this waggon be incomplete, the wounded in their hour of supreme suffering will not be suitably cared for. If it be complete, all that is urgently needed by the surgeons will be there.

In our army we use an ordinary general-service (lock-under) waggon, used in the everyday transport work of the service as our surgery waggon. The vehicle is identical, it is its contents which are peculiar.

All the equipment is detached, and is merely packed in boxes and baskets into the waggon, and in this procedure we must all agree. So peculiar and so different are all our English wars, that all specially fitted waggons must be reduced to a minimum, and our loads of every kind be reduced to the mule-carrier standard, and so packed into varying waggons. The waggon then needs no special description ; it is made to take to pieces and to pack up on board ship ; it has four wheels (two lock-under), and is drawn by two horses, and may either be driven postillion fashion or from the box. It costs at Woolwich Arsenal,

Fig. 25.



SURGERY WAGGON OF THE AUSTRIAN RED CROSS SOCIETY, BY LOHNER OF VIENNA.

empty and unequipped, £127 12s. and weighs empty about 17 cwt.

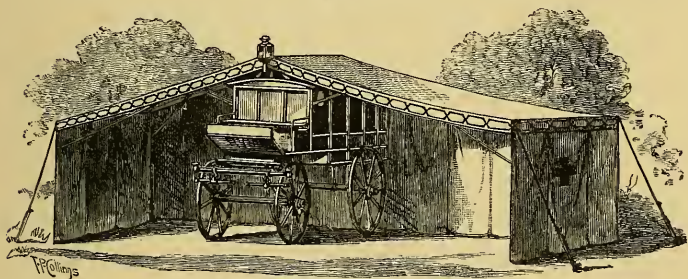
The Operating Tent supplied to the surgery waggon is an ordinary bell tent of the army pattern, price £5 5s. It is light, it is true, but it has no other special qualifications. It is quite unfit for operating in, for the doctors have not room to turn in it, and the central pole is in the way.

In the German service a special pattern of "operating tent" is issued ; it has a ridge pole, two upright poles, and can have one side raised like a verandah, forming an open shelter for the operating work.

Fig. 25 is a picture of the surgery waggon of the Austrian Red Cross Society, made by Lohner of Vienna. By comparison with our English surgery waggon it is light

and very easily moved. It does not take to pieces like our waggon. It costs, without any fittings, 750 florins, Austrian. We have here a plate of the same waggon, with its operating tent pitched over the waggon, turning the whole space into an operating theatre. This system of arrangement is criticised, as of course we cannot always secure ground suitable for the waggon and the tent. But the plate shows the size and character of the operating tent and how much more suited it is for the surgeon's work. Some such tent is needed in the English service. The price of this Austrian tent is 400 florins, Austrian currency.

Fig. 26.



SURGERY WAGGON OF THE AUSTRIAN RED CROSS SOCIETY, SHOWING THE SPECIAL OPERATING TENT PITCHED OVER THE WAGGON.

The Operating Table.—Two kinds of operating tables for ambulance work exist in our service; one pattern for the bearer company, and one pattern for the field hospital. The latter, which costs 10 guineas and weighs 77 lb., is very elaborate, and is modelled on civil peace-hospital operating tables; the bearer-company table is like an ordinary camp table, folding up in a compact way, and it seems quite useful enough for war work. It can be used as an ordinary office table if not needed for its special duty, and this is an important fact to be remembered, for, despite the popular idea to the contrary, army surgeons are not always operating, and a table that would be interchangeable seems to us to be more generally useful for war work. Price of operating table of bearer company, £3 10s; weight, 52 lbs.

The instruments, medicines, medical comforts, cooking and feeding equipments are all carried in eleven separate boxes or baskets, which fit in two layers into the waggon. Some of these boxes and baskets are of extraordinary dimensions ; the F basket, which contains the reserve dressing, being amongst baskets a very leviathan, and not suited for many of our frontier wars. In the ideal surgery waggon, every box and basket should be ruthlessly cut down to mule-pannier size (80 lb. weight), the number of them if needs be increased ; but with our petty wars we must have a general service equipment, and our loads must be available for coolie carriage, mule carriage, &c., and waggon carriage. This can only be done by choosing a small general service unit of size and weight, and fearlessly compelling all loads to be modelled upon it. Such a surgery waggon with uniform mule-pannier loads can be very easily produced, as only a few baskets and boxes need change.

It is impossible to dwell too much on the need of having efficient and ready means of cooking broths for the wounded. This battle-field aid is all-important, and whatever develops it should be encouraged. The baskets of the bearer-company surgery waggon, empty, cost £46 15s., and are supplied at present by Savory and Moore, New Bond Street, London.

The A, B, and C canteens cost about £23, and the two medical-comforts boxes about £7 5s.

2. *The Pharmacy Waggon of the Field Hospital.*—This is found in most European armies. It is the general medicine store and dispensary of the field hospital, and the waggon used in our army is singularly complete in every detail, and well worth studying. It is somewhat like a baker's cart with covered-in roof, and has numerous drawers and slides holding drugs and dressings. There is a dispensing table at the rear of the waggon, and a pent-house cover over it. Its price without the drugs or instruments is about £217. In this, as in all war equipments, we must measure all things by our peculiar campaigns. We English,

with all our humanitarian ideas, are the great fighting nation of the world. Our temple of Janus need hardly have any gates, so rarely do they need closing. This constant warfare means constantly changing war conditions, and hence we need again the interchangeable unit. However much we may wonder at and admire the pharmacy waggon, we seem compelled to say "C'est magnifique, mais ce n'est pas la guerre." It is heavy (weight 18 cwt. 3 qrs. empty), and perhaps top-heavy. But its prime defect is that its contents cannot be taken out and loaded on mules, or carried by coolies, if the waggon breaks down, and these are the true tests for our varying wars. Probably several sets of mule medicine-panniers, containing the same amount of drugs, would be more generally useful, and would do for Egypt, Ashanti, or Affghanistan, and would suit, when packed in a waggon by the dozen, for a European campaign.

3. *The Field-Hospital Store-Waggon* contains all the bedding, feeding utensils, and cooking arrangements for fifty sick. It is a four-wheeled, two-horsed, "lock-under," general service waggon, with some slight alterations to suit its special work. In this, as in all war-equipment waggons, the 80 lb. mule-pannier unit should be as far as possible the rule. Price, £151. Weight, 20 cwt. 34 lbs.

4. *The Kitchen-Waggon of a Field-Hospital* is a special waggon which does not exist in the English service, but is found in several European armies, for cooking for the sick and wounded. It is generally made of two sizes, one to cook for 200 men, and the larger size for 400 men. The former is an arrangement of boilers, with a furnace or grate below, mounted on wheels, and drawn by one horse. The cooking is done in the open air, and can be done on the move as the column marches. In the larger size waggon the cook stands in the waggon, and it is really a small cook-house on wheels. This latter vehicle is for English wars quite out of the question, but it is probable the 200-unit cooking or kitchen-waggon could be utilised if made to pack on mules. Those desirous of studying this

kitchen-waggon question further will find pictures and description of both such vehicles in the ('Freiwilliger Sanitats-Dienst in Kriege'), being the official handbook of the Sovereign Order of the Knights of Malta (of the Bohemian Langue.) Vienna, W. Seidel & Sons, 1879. The cooking-waggon or portable field-kitchen in use by the Swiss medical service seemed to me to be light and portable. It may perhaps be in the Exhibition.

5. *The Water-cart of the Bearer Company and Field-Hospital.*—Water-carts of the general army pattern are supplied to field-hospitals and bearer-companies. They are simply wooden hogsheads (108 gallons) on a wheeled stand, Maltese cart (mark III.), very like ordinary civil water-carts. They are drawn by a pair of horses. Every field-hospital and every bearer-company has two such carts. In our Eastern wars skins are largely used for water-carriage, and the human water-carrier, or *bihisti*, is a conspicuous figure in every Eastern campaign. He carries water in a goat-skin *masak* borne upon the hips. He takes his place in the fighting-front of the line, and is often one of the most popular men attached to a company.

The water-barrel of the English army water-cart is very difficult to cleanse within—this can only be done by taking out one of the heads. The number of taps also is not sufficient to ensure rapid filling of many water-bottles. In warm climates, if not in daily use, the hogshead warps, and is not serviceable for some time, until the wood swells again.

Captain J. Jones, of the Royal Engineers, has designed a water-cart consisting of a galvanised-iron tank, mounted upon a Maltese cart (mark III.). It contains 119 gallons. It has a man-hole with cover, for filling and cleansing the tank. An iron partition divides the tank within into two compartments, and the partition is pierced with holes, which allows the water to pass through gradually, thus breaking the rushing of the water about the waggon when the tank is partly full. There is one large tap and six small ones, thus allowing several water-bottles to be filled

at the same time, which is of great importance when many men have to be supplied.

For bearer-company work, and indeed for field-hospital service, a certain number of galvanised-iron cans with spouts should be hung on to the water-cart, for aiding in distributing the water to the bearers to fill their water-bottles; a few drinking-cups of metal might also be attached by chains to the cart, as men drink slowly out of their bottles, but quickly out of open cups.

At the School of Engineering at Chatham water is distributed to the working parties in small kilderkins mounted in wheel-barrows. They are really miniature water-carts. A few such hand water-carts would be useful with a bearer-company or field-hospital. It should not be difficult to make an iron tank of such size as to be utilised for a mule pack-saddle water-barrel, to be borne in pairs on a pack-saddle, and to which tank a pair of removable iron handles and a wheel might be attached, converting the whole in a hand water-cart.

This wheelbarrow system could also be applied to the conservancy arrangements as suggested by Dr. Veale in the Egyptian campaign. The barrow to be utilised as a latrine receptacle capable of being wheeled away from the camp when necessary to be emptied, and on the march forming a mule load, or packing into the store-waggon of the field-hospital. We are merely on the threshold of many such inventions, which will be intensely useful in peace as well as in war.

6. *The Laundry-Waggon of a Field-Hospital.*—No one with any war experience will controvert the opinion that an efficient laundry with a good working staff is essential in all war-hospitals, be they field, general, or ship medical establishments.

We learned in the long Afghan campaigns to value the washerman and the conservancy man in the very highest degree. For sick men to become infested with vermin is lamentable, and against such suffering efficient laundry work is the only safe defence. In all general war

hospitals we must ever regard the laundry as needing very accurate and detailed organization before the army takes the field. Dr. Parkes dwells with great urgency on this point. Dr. Bleckley, in his hospital-ship report, also refers pointedly to it, and all war surgeons must echo the cry for laundry efficiency.

Up to the present time we can find no record of any army having a war-hospital mobile laundry, or laundry-waggon. European armies campaigning on the European continent can find in the conquered districts civil labour ready to do this work. The English medical service in this as in many other points is entirely dependent on its own previously organized resources. We find no local aid on Crimean steppes, in New Zealand fern-thickets, on Afghan mountain sides, nor midst the dense Ashanti jungles. We must in all cases arrange our laundry staff in England and carry them to the seat of war. We shall be the first nation probably to equip a mobile laundry-waggon, combining boiler, washing-machine, and drying closet. Dr. Parkes mentions that Mr. Hooper, superintendent of the Renkioi Hospital during the Crimean campaign, designed a laundry-waggon to accompany troops in the field. This was in 1856, and washing-machines were then in their infancy. To-day there would be nothing easier than to design a portable boiler, washing-machine, wringing-machine, and mangling-machine, all in one waggon; but as to the drying-closet, one is not so clear, but doubtless this too is not impossible. There may be some laundry-waggon in the Exhibition. It is difficult to overrate the need of such an article of equipment with war hospitals. It should be so made that, on arrival in camp, the horse which drew the waggon should also furnish the motive power for washing the clothes, somewhat like a mill-horse system.

7. *The Electric Light Waggon of the Ambulance Column.*—Baron Mundy of Vienna, the well-known ambulance organizer, has applied the electric light to the searching of the battle-field at night for wounded.

A four-wheeled carriage contains the necessary apparatus, including engines and dynamos. It is quite mobile. The whole apparatus is manufactured by *Sautter-Lemonier*, 26 Avenue de Suffren, Paris.

Several demonstrations of this adaptation of the electric light took place at Vienna during the Electric Exhibition, and it is not unlikely we may have such a display in London during the Exhibition.

For military purposes in its wider sense such a waggon ought to be very useful, and it will probably be found to be much used in all future wars.

MILITARY AMBULANCE SICK-TRANSPORT WAGGONS.

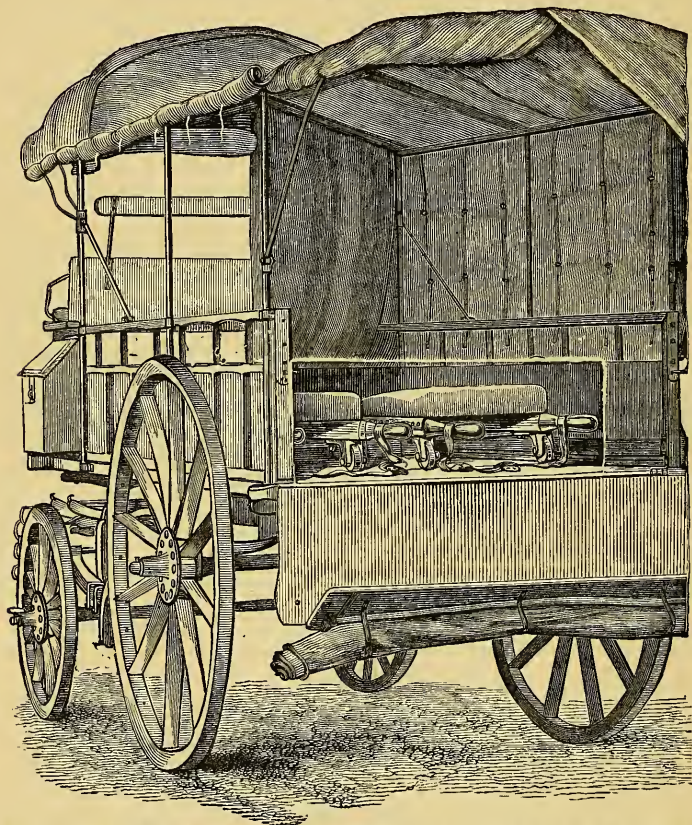
In a mere primer such as these pages are intended to be it would be quite impossible to deal at any length with the voluminous subject of military sick-transport waggons. Those who desire to drink deeply of the stream of literature on this subject are referred to Surgeon-General Longmore's classic and exhaustive work on the transport of sick and wounded troops, published by authority and to be obtained at any military bookseller. Price 5s. In this work every variety of waggon of this and every other country is fully dealt with by descriptions and illustrations. Certain conditions are needed in English war sick-transport waggons, which Surgeon-General Longmore summarises as follows :—

1. There must be suitable springs, to diminish the shocks and force of concussions in passing over bad roads.
2. Provision must be made for men lying down as well as sitting up—that is, for seriously ill and for convalescing cases.
3. The carriage must take to pieces for embarkation in ships for foreign wars.
4. All parts of all waggons should be interchangeable.
5. Durability and lightness are essential in proper amount.
6. Water must be carried in the waggon ; also stretchers,

and some articles of surgical dressing and restoratives. Also means of carrying the arms and kit of the sick.

7. It must be covered from the weather, be it hot or cold.
8. It should be easily loaded with its sick.

Fig. 27.



ENGLISH ARMY SICK-TRANSPORT WAGGON, SHOWING THE FARIS' STRETCHER RUN IN ON THE FLOOR OF THE WAGGON.—CENTRE BOARD NOT SHOWN IN ENGRAVING.

The English Regulation Sick-Transport (Ambulance) Waggon has four wheels. Two of large size (56 inches diameter) behind, and a smaller pair (36 inches in diameter) in front, locking under the carriage, and thus enabling it to

turn round on a small axis, and greatly obviating the risks of upsetting. Waggon's which have equal wheels before and behind are called "equirota waggon's." The body has a floor space, 9 feet 4 inches long by 5 feet 3 inches wide, and rests upon the axletrees by semi-elliptical springs, with a check-spring under the centre of the waggon.

The wooden sides are about 20 inches high, and from them run up from sockets three iron standards on either side, supporting an angular framework of ash hinged along the centre, forming the waggon roof, which, with the sides, is covered by white canvas, dropping as curtains over the waggon, and forming also a hood to protect the driver and patients in front, and curtains to shield those sitting behind. A canvas curtain also closes the front of the waggon behind the driver's seat, preventing wind and rain entering the waggon from that end. The interior of the waggon is divided longitudinally by a partition 14 inches high, which separates the floor into two equal portions, and these portions are occupied by two stretchers of the ordinary "Faris" pattern, which are run in on their wheels into the waggon. Besides these lying-down arrangements for two patients, three individuals, viz. the driver and two patients, can sit on the front driving seat ; and three more, two patients and an orderly, can sit on a hind seat on a level with the floor of the carriage, with their legs hanging out, and protected by a tail-board and leather apron. A sliding partition of wood is placed across the waggon near the rear, acting as a backboard for those sitting on the hind seat. Both seats have leather-covered cushions. Water is carried in a tank (9 gallons) under the body of the waggon, and there is also a corn locker at the rear of the floor of the waggon. A ladder, for use of the patients entering the vehicle, is carried along the sides of the waggon. There are two lockers, one on either side of the sides of the waggon in front, one being used for restoratives, and the other for tools, &c. A double-screw brake worked by a cranked lever handle acts on the hind wheels ; a drag shoe is also carried.

The rifles and kits of the sick are placed on the floor of the waggon. The waggon weighs about $17\frac{3}{4}$ cwt., empty, and with eight persons and their kits, 30 cwt., and costs at the Royal Arsenal £186.

For shipment, the vehicle takes completely to pieces, the iron supports, and the roof come off, and the wooden sides are likewise collapsible. The wheels are taken off and the tail-board, and the whole can be packed into a ship-space of about $3\frac{1}{2}$ tons. The waggon is usually drawn by two horses, and can either be driven, by pole or shafts, from the seat in single or double harness, or by a postillion riding one of the horses.

The existing new-pattern waggon which we have just briefly described, also differs from the old-pattern waggon by not having a special "waggon-stretcher." The waggon-stretcher was a special article to which the wounded were transferred from the field-stretcher, and then run into the waggon. Surgeon-Major Faris having adapted wheels to the field-stretcher, it is alone used, and runs in along the waggon-floor without the patient being shifted in any way. Spare field-stretchers to the number of four are carried in each sick-transport waggon, rolled up, and suspended by straps from the iron standards on either side.

This waggon cannot be regarded as final of its kind, and we shall refer to its interior arrangement and the system of carrying its patients in due course, but it is in every way a great improvement on the original patterns of waggons introduced after the Crimean campaign.

It must always be remembered that all military carriages in the English service are built by the same department that construct the gun-carriages of the Artillery.

As a result of this system, our ambulance sick-transport carriages are heavier and more weightily constructed than is needed. No doubt the officials charged with their construction can produce many examples of broken vehicles which have given way before the shocks of field service. But it is to be remembered that if one sees carriages constructed on artillery lines, the tendency is to

use them in the rough artillery fashion, and to so load them, and so drive them, as if they were horse artillery gun-carriages taking a "bee line" across country. This very rudely strong construction then probably defeats its own end, and lighter carriages, built like the tradesmen vans we see so largely used in business work, would probably never be so heavily loaded, nor would the drivers attempt to thoughtlessly cross country with them.

If one had the power, one would like to withdraw all ambulance-carriage construction from the Gun-carriage Factory, and place it in the hands of civil coach-builders, explaining to them what was needed for us, and offering a prize for the most suitable article.

It is absurd to think that the mere fact of having to take a vehicle to pieces for shipment should necessarily handicap its construction. Such needs could easily be met by civil coach-builders, and no doubt many new combinations would be seen.

The National Aid Society, with its blank cheque on the wealth and philanthropy of the public, might well offer a prize for such a vehicle.

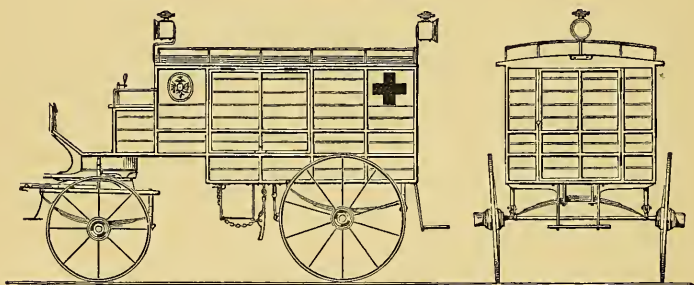
We must point out then in criticising our military sick-transport waggon, that, with all its huge space, practically only two seriously wounded men can be carried lying down, and that four more slightly wounded are carried, two in front, and two in the hind seat of the carriage. Can we consider this as a perfect waggon? Can we consider that a seat with the driver on a wet or snowy day or night is a suitable place for a wounded or sickly man?

The verdict would frankly be no. Nor can we consider the hind seat, with its apron and tailboard, a very desirable place for delicate men in bad weather, apart from its back-board blocking up the thoroughfare or free entrance for the attendants into the sick men lying within. In point of fact, the two patients with the driver would be frozen with the cold, and the patients behind completely stop the way to allow the orderlies to feed or supervise the serious cases within.

These defects have then to be dealt with, and they point to the absolute need of arrangement for four lying-down patients, or two lying-down patients, with four others sitting in omnibus fashion, well protected within the vehicle. This arrangement would leave the driver's two seats available for carrying the nursing orderlies of the hospital, and also the hind seats for the same purpose.

It is absolutely essential to remember that if we make our nursing orderlies march, without any carriage being given them, they become so wearied as to be unfit for work on arrival in camp—the very time when doctors' and

Fig. 28.



SICK-TRANSPORT WAGGON OF THE AUSTRIAN RED CROSS SOCIETY, VIENNA, BY LOHNER & CO., VIENNA.—CARRYING FOUR PATIENTS LYING DOWN, OR TWO LYING DOWN AND FOUR SITTING OMNIBUS FASHION.

orderlies' work begins. Of course, the seats we speak of would always be available for sick or wounded in great emergencies, but for routine purposes the interior of the waggon should be ample and sufficient.

Let us first glance at the construction of some foreign waggons.

The sick-transport waggon of the Austrian Red Cross Society, built by Lohner & Co. of Vienna, seems a very lightly built yet strong vehicle. Its whole construction is more after the fashion of the hickory and steel combinations of America than of our artillery-waggon-like structures. At the Berlin Exhibition the waggons built by this well-

known Viennese firm seemed to be the lightest in construction of any present, although practically all Europe was represented, England excepted.

Any who desire to see the various designs of ambulance vehicles made by this house should write to Lohner & Co., Hofwagenbrik, Vienna, Austria. Price of this sick-transport waggon, 850 florins ; cost of packing for London, 40 florins ; transit cost, viâ Hamburg, 200 florins.

We are not able to give absolute data of weight of this waggon, but the whole impression given was one of extreme lightness. It does not take to pieces for embarkation, as that is not a factor in Continental waggons ; but it is probable that this packing-up difficulty is a mere bugbear, as any coach-builder should be able to simplify his construction so as to let the structure be easily taken to pieces and set up. The whole of the woodwork seems very light, the heavy hind seat and tailboard is absent, and the whole style is like a private omnibus rather than an ammunition waggon.

Four stretchers for seriously wounded cases can be carried, loaded with patients ; but if this is done, the entire interior of the waggon is filled. These four are carried in this way : two suspended above, and two below on either side of the waggon.

The mode of running in the stretcher, always difficult with us, is simple.

Halfway up the sides of the waggon runs a narrow iron rail or tramway, about a quarter of an inch wide ; a similar tramway is supported down the centre of the waggon by a central standard of iron. On this tramway on either side runs four tiny wheels, which run easily on the narrow rails. From these four wheels hang four leather loops.

When a patient comes on the stretcher, the four wheels and their dependent loops are drawn to the rear of the waggon, and the handles of the stretcher slipped into the pair of loops belonging to the right or left side, and the little wheels are then run down the tramway, and the stretcher dependent from them glides into its place, the

rear handles being fitted into the rear loops. This method is repeated on either side, and at the top of the sides is a similar tramway which takes the two upper stretchers, thus holding four in the interior. If two patients are carried lying down, one above the other on one side, the opposite side can be used like an omnibus seat for four or more patients, sitting in an ordinary omnibus fashion—a most important arrangement; sheltering them from the weather, and allowing the attendant to pass in, to nurse the serious cases if needs be.

It must also be remembered that in war and in peace many men are not seriously ill, but want suitable conveyance, only seated. Our English waggon constantly has its interior empty if there be no lying-down cases, but owing to the absence of any removable omnibus side-seat system in the interior, the invalids must either sit with the driver, and be exposed to cold and wet, or with the hind-seat attendant, also an uncomfortable position.

The Rucker plan of interior arrangement of a sick-transport waggon is very interesting. It was favourably reported upon by the United States Army Medical authorities. Four patients can be carried lying down, or eight or ten sitting in omnibus fashion. No. 1 (Fig. 29) shows the carriage arranged as an omnibus for eight or ten men, the seats being along the sides of the waggon. In No. 2 the seats have been lowered to the floor of the waggon, ready for two seriously ill cases, and the backs of the seats have been raised to a horizontal position to receive the two stretchers carried previously suspended from the roof.

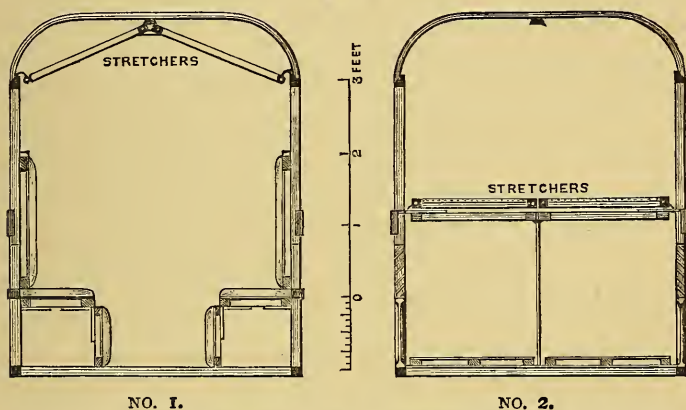
Both these systems seem to be rational and common-sense. A waggon carrying only two serious cases is not the best for the great demands of war, and the alternative omnibus system of side seats is absolutely essential for peace work, and for the sick convoys which in war time contain many convalescent men who, while not needing lying-down space, could not sit on a coach-box in bad weather.

It will be seen, then, the lines on which change might be made in our waggon.

First of all, a definite removable omnibus side-seat system, either of the Rucker or Lohner type, is as essential as it is easily done. It will be a great boon to the soldier.

Second: while maintaining, as at present, the two-wheeled stretchers on the floor of the waggon, a tramway of iron might be fastened to the existing iron standards, and a

Fig. 29.



CROSS SECTION OF THE RUCKER WAGGON.

No. 1, arranged for patients sitting. No. 2, arranged for patients lying down; the seats being detached, lowered, and acting as stretchers. The back of the seats being raised, and supporting two stretchers brought down from the roof.

central standard erected in the waggon. Along this tramway small wheels with dependent loops, after the Lohner system (Austrian Red Cross), might be placed so as to run in two upper stretchers, making a total of four lying-down patients' spaces.

In everyday work we would find that two stretchers on one side would be used, and the omnibus side-seat on the other side would be simultaneously utilised. Few will deny that so simple a change will be fraught with comfort to the sick. The seats with the driver and the

hind seat can then be utilised, if needed, for the nursing staff, for which they alone are suited.

It should not be impossible to devise a sick transport-waggon, which, when not in use, could be completely dismantled; its seats being utilised in the field-hospital tents as seats or benches; its sides as tables, its cover as a *tent d'abri* for the driver, its pole for a flagstaff, and its water-tank as a water-tank. In this way the exposure to the sun and the rain, which in war time injures greatly all vehicles, might be minimised, and the sick benefited by the extra comfort derived from the tables and seats, so needful, and yet so ever absent in war. English ingenuity has, as yet, made no step whatever in the direction of ambulance-equipment development; but as the people get more taught about the subject, development must come.

Should not our medicine-waggon take bodily to pieces, and go in under cover as part and parcel of the dispensary-tent, making up into tables and benches?

Should not our equipment-waggon themselves likewise furnish extra comforts to the sick, as tables and articles of furniture?

Should not every hospital-waggon of every kind carry with it its share of the hospital staff. The storekeeper seated on the store-waggon, the dispensers on the medicine-waggon, the watermen on the water-cart, and with the bearer company, should not the omnibus arrangement of the interior of the sick-transport waggon be in war time, and in the urgent need of rapid advance, utilised as a means of carrying the ambulance-bearers themselves to the scene of action? Just as a horse-artillery battery can move more quickly than a garrison battery, so should a bearer company be able to move rapidly to the field of action. This is certain to be one day the rule.

It is thus that gradually the noble dreams of Larrey and Percy, and the wishes and aspirations of those hopeful English army surgeons who lived in the far-away past, will one day be realised.

The one way, the only way, to achieve it is to tell the

nation our wants, and to teach the people how to be humane. That good work once done, all the rest will assuredly follow.

CIVIL AMBULANCE SICK-TRANSPORT WAGGONS.

For civil ambulance sick-transport waggons, such as would be needed for municipal or rural work, the requirements are different from what is essential for military work. In the first place, the carriages need not take to pieces for embarkation, a difference affecting the character of the structure.

Secondly, the carriage can be made with a crank-axle, that is, one which sinks much lower than the height of the centre of the wheel, enabling the waggon-body to ride at a level near the ground; this is seen in Dr. Howard's ambulance transport-waggon.

Thirdly, the whole of the fittings can be of a more luxurious character in civil conveyances, and lightness can be carried to a very marked degree.

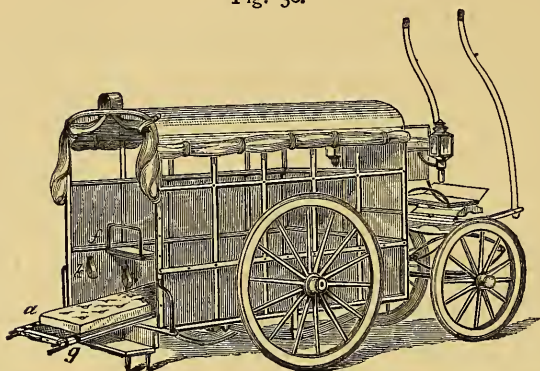
HOWARD AMBULANCE SICK-TRANSPORT WAGGON.

Dr. Howard's sick-transport waggons are now fairly well known to the public. They are the waggons used by the London Ambulance Service, and are to be found at the Fulham, Stoke Newington, and Lambeth Police Stations, as before mentioned.

It is practically a little apartment on wheels, 6 feet 6 inches by 4 feet 1 inch, in which on a sliding litter a patient can lie, with an attendant seated beside him. The vehicle can be placed on a railway truck or steamer without difficulty. It is drawn by one horse, and is very light, owing to the crank-axle the floor of the waggon is within 15 inches of the ground, and the tail-board drops down to form a step halfway between the distances. The hind wheel is large, and is in the centre of the vehicle. The floor is below the centre of motion, and the spring from which the body of the carriage is suspended is a very long semi-

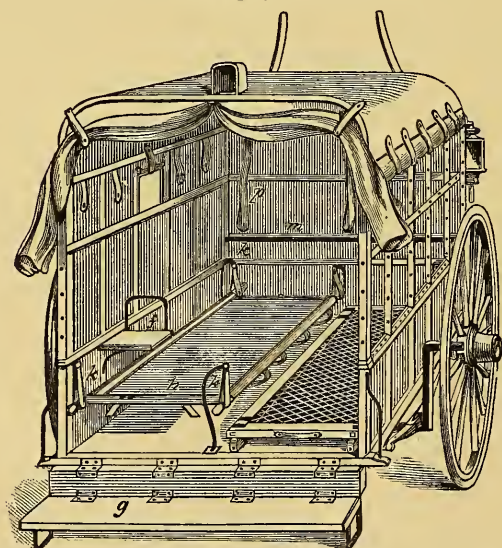
ellipse. The four wheels have rubber tires. The entire carriage turns on its own axis. Beneath the driver's seat

Fig. 30.



DR. HOWARD'S AMBULANCE SICK-TRANSPORT WAGGON. (External view.)

Fig. 31.

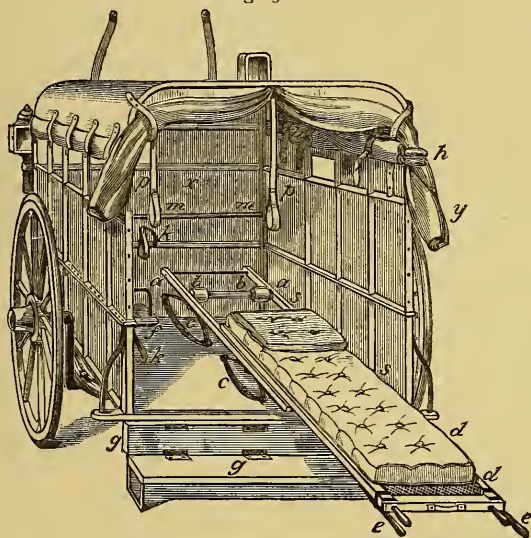


DR. HOWARD'S AMBULANCE SICK-TRANSPORT WAGGON.

is a box for surgical appliances, and there is an opening to it from the interior of the carriage. Shafts and poles are

supplied, and either one or two horses may be utilised. In the interior the right half of the floor is occupied by a light tramway, with india-rubber roller tires. The tramway rests on four elliptical springs, the pair at the head being 6 inches higher than those at the foot. Between the side of the tramway and the side of the vehicle are india-rubber buffers. Resting upon the india-rubber rollers is a light

Fig. 32.



DR. HOWARD'S AMBULANCE SICK-TRANSPORT WAGGON.

(a a.) Tramway. (b b.) Rubber rollers. (c c.) Counterpoise springs. (d d.) Litter. (e e.) Sliding handles. (f.) Attendant's seat. (g g.) Tailboard. (h.) Folding stretcher. (i.) Suspension loops. (m.) Supporting bar for police stretcher. (p p.) Patient's aid straps. (s s.) Lateral buffers.

cane-bottomed litter with sliding handles. Upon the litter is a thin hair-mattress and pillow.

The front litter-bearer walks into the carriage, and rests the litter on the rear roller, the rear bearer then pushes in the litter into position. A suspended strap is for the patient to lift himself up if desired, and a corresponding strap at the lower end may support a fractured limb.

The other half of the interior has in it a seat for the attendant, and is otherwise clear at ordinary times ; but if a second patient needs to be carried, a stretcher is kept in the roof of the carriage, and can be lowered and suspended by loops hanging from iron supports in the floor, and lies at the same level as the left-side litter.

If four patients have to be carried, two other stretchers are needed, and these rest with their front handles on an iron bar, running across the back of the front of the carriage, and the rear handles rest on the iron-bound top of the tail-board.

For ventilation and lighting, openings covered by canvas curtains exist, and doubtless for our climate some of the openings should be covered in by light wooden shutters.

If desired, the carriage can be cleared out of all its contents, and will remain available for any ordinary carrying purposes.

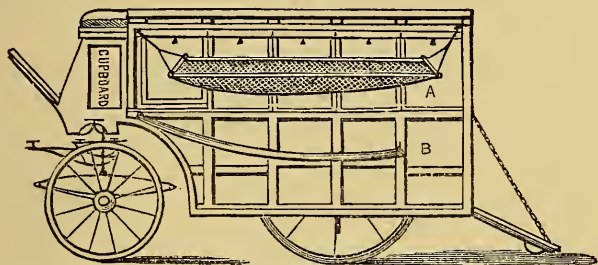
The price of this carriage is about £60, and it is made by the Alexandra Carriage Works, 12, Long Acre, London, W.C., from whom no doubt plates and price-lists could be obtained by any persons enquiring on this subject. A much smaller size of this waggon is made, to hold a single patient, without room for any attendant, and to be drawn by a man, or by a donkey or pony. It seems to me to be very useful for village work, and the vicar of Stepney, who has one for use in his parish, writes favourably of it. Its price is £40, from the same makers: with shafts the cost is £45.

Both these classes of waggons may be supplied to suitable districts in the London Metropolitan district by the London Ambulance Service as a philanthropic work, and applications for further information should be addressed to the Honorary Secretary of that Service, A. H. Haggard, Esq., London Hospital, Mile End, London, E.

DAVY'S AMBULANCE SICK-TRANSPORT WAGGON.

Mr. Davy, one of the surgeons of the Westminster Hospital, London, has constructed an ambulance transport carriage, in which he utilises slung hammocks or suspended

Fig. 33.



DAVY'S AMBULANCE WAGGON.

cots. The waggon can be ran on to a railway truck, and the patient, without leaving the original conveyance, is taken to his destination.

FURLEY AMBULANCE SICK-TRANSPORT WAGGON.

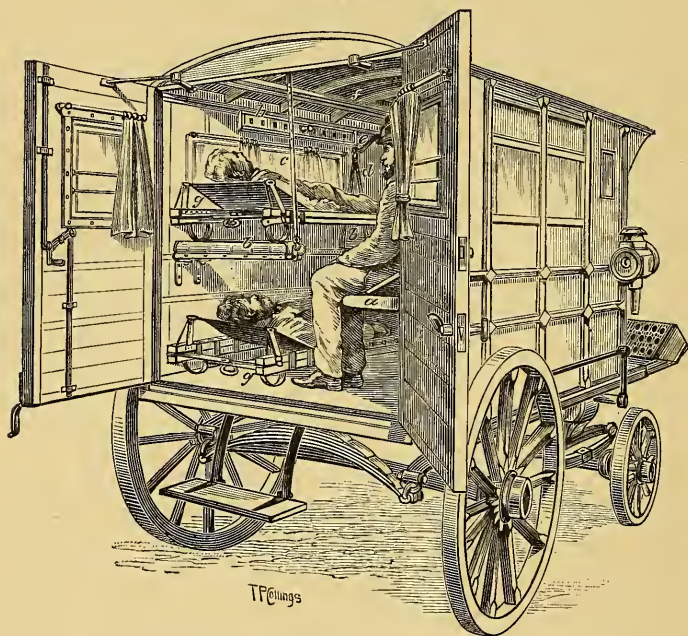
This is a one-horse ambulance carriage of varnished wood, with English oak wheels and sliding windows. It carries three patients; two on stretchers on the floor, and a third suspended from roof, and two attendants. The driver's seat is hooded, and there is room for the two attendants on the box. The third stretcher is suspended by a hook from a little trolley with four wheels, which runs along two wooden rails (*f*) fixed to the roof of the vehicle. The handles of the stretcher are placed in the loops, and the trolley runs down to the far end of the carriage, the rear end of the stretcher resting on a padded bar (*b*) which juts out from the side of the vehicle, and can, if not needed for use, be detached at pleasure.

Mr. Furley has also devised a system by which any private omnibus or such-like conveyance can be converted

pro tem. into an ambulance transport-waggon. This is done by the same trolley system running along the roof of the carriage, and with loops suspended from it.

The handles of the stretcher are placed in the loops, and the trolley slides along the tramway, and runs the stretcher home into the carriage; the rear handles are then rested on a padded bar, which can be removed when not needed.

Fig. 34.



THE FURLEY AMBULANCE WAGGON.

This system of a convertible omnibus ambulance is very useful, as there are many country houses which have omnibuses, but which only once in a way need to use them as ambulance transport-waggons. This interchangeable system of Mr. Furley may be considered to fill up a distinct want in everyday life. Further particulars as to Mr. Furley's waggon could be learnt by addressing that gentleman at St. John's Gate, Clerkenwell, E.C.

THE ATKINSON-PHILIPSON SICK-TRANSPORT WAGGONS.

Messrs. Atkinson and Philipson, 27, Pilgrim Street, Newcastle-on-Tyne, have devoted considerable attention to ambulance construction for accident cases and for infectious disease. They are able to supply a very comfortable and well-finished sick-transport waggon for from £65 to £75, and have also cheaper patterns as low as £45 to £50.

Their best pattern waggon carries two patients lying down—one resting on the floor of the waggon, and one suspended above it on the same side by hooks from the roof, and on the opposite side is room for one sitting patient and two attendants. An attendant can also sit with the driver in front of the waggon.

The waggon has four wheels, the two in front being lock-under, and having crank axles the body of the carriage rides conveniently low. The firm forward plates and prices of waggons to all applicants.

AMBULANCE TRANSPORT WAGGONS FOR INFECTIOUS DISEASE.

These ambulance waggons should not vary externally in any marked degree from ordinary accident-waggons. What is needed for them is extreme simplicity of internal arrangement, every possible means of harbouring infection being removed. Every portion of the carriage interior should be removable, and the litter or stretcher should have a wicker or canework bottom. All iron-work should be galvanised, as the disinfectants used destroy the ordinary paint, and rust the unprotected iron.

Some waggons are lined throughout with sheet zinc, unpainted.

To save the labour of attendants, and to secure complete disinfection, a small hand pump which forces the disinfecting fluid into every part of the carriage is useful; it saves the labour of mopping out the interior.

The need of ample ventilation in such conveyances is

self-evident, especially for the sake of the nurse or attendant seated in the carriage.

For communication between the driver and the attendant, a speaking-tube is not desirable ; but a dial, with faces on the outside for the driver, and on the inside for the nurse, with an index pointing to the words, " Stop "—" Go on "—" Drive gently "—is useful. There should be no special compartments for medicines or restoratives in such carriages, as these nooks harbour disease, and cannot be easily disinfected. A basket containing all needful medicines or dressing articles should be taken by the attendant in his own hands into the waggon. The blankets used for keeping patients warm should of course be at once disinfected after each case.

On the rigorous precautions as to the clothes of attendants there is no need to dwell here.

The Alexandra Carriage Factory, at No. 12, Long Acre, manufacture infectious-disease ambulances for the Metropolitan Asylums Board, at a cost of 72 guineas each.

The same firm make an infectious-disease ambulance on Dr. Howard's principle at a cost of 90 guineas. The firm issue engraved pictures of their infectious-disease sick-transport waggons. Some singularly neat-looking infectious-disease ambulance conveyances are made by Lohner of Vienna—the well-known carriage-builder—and those interested should write to him for his pictures of the conveyance. Lohner & Co., Hofwagenfabrik, Vienna.

CHAPTER XI.

RAILWAY AMBULANCE AND SICK-TRANSPORT SYSTEMS.

Crimean Railway carriage of Sick—The younger Baron Larrey's work—Dr. Gurlt's efforts—The American Railway Sick-transport systems—Description of Baron Mundy's organization of the Austrian Maltese Knights Order's Ambulance Trains—Descriptions of the various carriages in it—Extemporised use of Railway Carriages for Sick-transport—Zavodovsky's system—Grund's system—Beaufort's system—The Hamburg system—Civil Railway transport systems.

THE important part played by railways in modern war has reacted to the very fullest extent on the medical services of the various European armies. The removal of the sick and wounded to the base of operations, or to far-removed hospitals in their own countries, is now as recognised a part of a great war system as the use of the railway in mobilisation is a factor in military administration.

We find that from the first development of railways, some forty-five years ago, no war on a large scale took place on the European mainland giving an opportunity of trying the use of railways for the removal of wounded until our own times.

In the Crimean campaign, the railway built from Balaclava towards the front was used in a haphazard way to carry wounded and sick, but without any *matériel* suited for the purpose.

In 1857, the younger Baron Larrey made some experiments at the Camp at Chalons in this direction, and some rude contrivances were adopted for use in carrying sick men to the general hospitals.

In 1860, Dr. Gurlt of the Prussian service devised a

system of hammocks slung from the roof of carriages for conveying the sick.

But for the true era which marks the fuller development of the railway idea in removing sick and wounded in war time, we must look across the Atlantic, and we find that in the great war of the Rebellion in the United States these ideas were very fully carried out.

The United States had everything in its favour for achieving success. When a nation has the common sense to devise a system by which everyday travellers can pass from carriage to carriage in a train; by which in warm weather they can, as they need it, utilise iced drinks, and bathe and wash themselves; by which in winter the carriages can be warmed to any needed temperature by a stove common to a large carriage, and by a system which enables latrine accommodation to be available while actually *en route*, it does not need any very brilliant intellect to devise a very perfect hospital train. The American cars opening from end to end longitudinally, and all united to each other by a kind of drawbridge, are at once ready for sick, if only lying-down accommodation is devised for patients.

The Americans placed a certain number of upright posts along the central gangway or passage of the carriages, and on these uprights and against the sides of the carriages they hung strong india-rubber rings, into which the handles of the stretcher were thrust, and such stretchers placed in two tiers, one above the other, on either side of the central gangway, turned the carriage at once into an hospital waggon. Water was already provided, latrine-accommodation already existed, the stove was always there, and with these essentials arranged for, the wants unattended to are not many.

With such trains as these the Northern medical authorities carried back from the front, by the thousand, sick and wounded soldiers; and a great departure for good, and a distinct minimising of human misery may date from that era. There is really not much to say about the American

system, it is so self-evident, so common-sense, that it explains itself.

Ventilation of course must be very fully provided for, probably by roof ventilation, or by windows left open in the carriage. Add a cooking waggon, and a dispensary waggon and a store waggon, with a sleeping-car for the medical staff, and in such a train you can carry wounded wherever rails are laid.

In Europe, of course, all this is different. We still cling to the old coach system of separated compartments in our railways, and to say nothing of being murdered now and then, we get baked in summer, frozen in winter, and suffer much inconvenience in long journeys from want of suitable latrine arrangements in a truly Old World spirit.

Railway ambulance systems in Europe are practically of two kinds. One is the definite *train* system on the American plan, where the carriages are made to open at either end, and a free thoroughfare exists from the engine in front to the guard's-van behind. As the most perfect development of this *train*-type of ambulance-railway transport, we will glance at the elaborate trains of the Sovereign Order of the Bohemian (Austrian) Branch of Knights of Malta.

The other system may be termed the *carriage* system of ambulance-transport, where there is no central gangway through the train; but owing to various reasons, mainly the absence of end-communications, each carriage has to be dealt with independently, and as a separate unit.

All who desire to study from an exhaustive, complete, and elaborately detailed source the construction and equipment of ambulance trains, should obtain the official volume issued by the Austrian Branch of the Sovereign Order of the Knights of Malta, called "*Freiwilliger Sanitäts-Dienst im Kriege*," printed by L. W. Seidel and Son of Vienna for the Order. This most noble volume, which is entirely the outcome of the energy and self-sacrifice of Baron Mundy, the greatest living authority on ambulance organization, is so complete in detail, that, placed in the

hands of any railway carriage-builder, an ambulance train of singularly perfect character could be made up without one further word of explanation.

These trains now to be described are constructed and maintained at the cost of the Austrian (Bohemian) Branch of the Knights of Malta, an Order which still retains its estates of which the Order in most other countries has been deprived. Each train consists of 18 vehicles of every kind, and communication is open throughout. As it stands upon the railway line it would be marshalled as follows :—

1. Engine and tender, ordinary pattern.
2. Guard's-van with railway guard, ordinary pattern.
3. Carriage of special construction for the sleeping-places of the Knight representative of the Order and the medical officers.
4. Store waggon for carrying the wines and various eatables for use of the sick. Special construction.
5. Kitchen waggon of special construction, with all the culinary utensils and equipment needed by the cooks.
6. A refectory waggon—or dining-waggon—where the staff of the train and the convalescent patients who are able to move about can sit at regular tables, and have their food in comfort away from the sick carriages.
- 7, 8, 9, 10, 11, are five ambulance sick-transport carriages, each carrying ten patients lying down, on stretchers suspended along the sides of the carriages.
12. A magazine waggon containing the linen store, and the dispensary or pharmacy, containing all the medicals, instruments, and technical equipment needed by the medical officers.

13, 14, 15, 16, 17. Five more ambulance sick-transport carriages, each containing ten patients.

18. The guard's-van of the guard conducting the train.

We thus see that 100 patients can be carried lying down in the carriages, and that the train is absolutely self-contained, and is completely a unit in a military sense.

We may briefly notice the individual carriages.

The Medical Officers' Carriage does not need a special

picture. It is divided into distinct cabins for each medical officer. It has a lavatory, latrine, and in each cabin a couch, mirror, washhand-basin, drinking-vessels, &c., for the occupant. You must make your staff comfortable if they are to live in the train, and this Baron Mundy has done. It is absolutely essential to secure good work from good men. This carriage is joined by a movable bridge, over the coupling-irons of the train, with the *Store Waggon*, in which are contained in presses or cabinets along the sides the wines, the preserved stores, the biscuits, and the various food-supplies of the train. On the floor of the carriage are a series of ice-boxes for ice, and store-boxes for bread, meat and vegetables. This carriage does not need any special picture, as any intelligent carriage-builder would at once understand what was needed.

It practically amounts to a number of store-cupboards along the sides of the waggon, and ice-boxes and meat-safes below them. In the corner of the carriage is a screened-off compartment for an official. We then pass on to the

Kitchen or Cooking Waggon.—(Figs. 35, 36.) This is a special waggon, and we give here a section of the carriage and a plan of its construction. How completely essential good cooking is to the sick and wounded, medical men of all others recognize, and this waggon is very complete, enabling good work to be done.

On either side of the central gangway stand the cooking-stoves, warm-water holders, the water cisterns, the chopping-blocks, and the various cupboards to contain the articles needed by the cooks.

Along the sides are hung with order the culinary implements for cutting, chopping, &c., the meat, and the saucepans, are placed on the shelves. We have made such progress of late in England in stove building and kitchen arrangements, that, given a suitable carriage, any leading manufacturer ought soon to fit out the cooking-waggon. Next to the kitchen waggon comes the *Refectory or Dining-room Carriage*, which needs no special description. It has the

usual passage down the centre, and six tables with benches placed along the sides of the carriage. A sideboard with shelves above holds the various plates, tumblers, and table requisites needed by the train staff, and these are arranged somewhat like a ship steward's pantry or washup room. In fact, a ship's dining-saloon would be a capital model for equipping this carriage. There is a small bath-

Fig. 35.

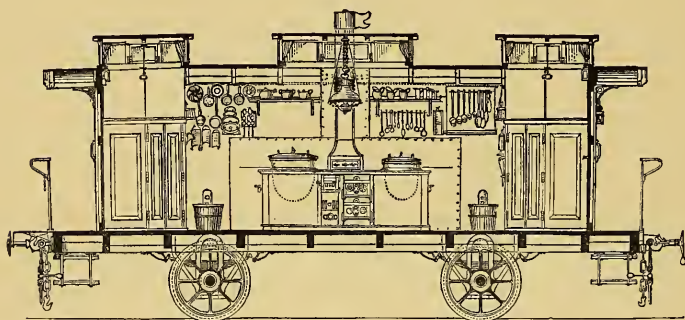
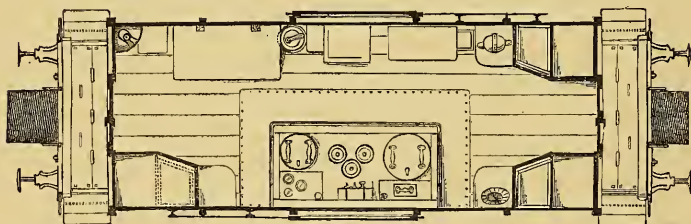


Fig. 36.



RAILWAY KITCHEN WAGON OF THE AUSTRIAN AMBULANCE TRAINS OF
THE KNIGHTS OF MALTA, AUSTRIAN BRANCH.

Upper plate—section ; lower plate—plan.

room for a douche bath, screened off from this carriage. How important it is to have the dining-room specially told off and separate, and to prevent eating in the sick carriages as far as possible, all medical men will agree.

The five sick-transport waggon now are come to, and we have here a plate showing their arrangement. (Figs. 37, 38.)

Each carriage holds ten patients lying down, the space

for two patients being occupied by the stove, lavatory, and latrine, with which each carriage is fitted. These occupy the middle compartment on one side, reducing the accommodation by two lying-down spaces.

The arrangement of the stretchers is very simple ; they are placed in an upper and a lower tier on either side of the gangway, six on one side, and four on the other.

Fig. 37.

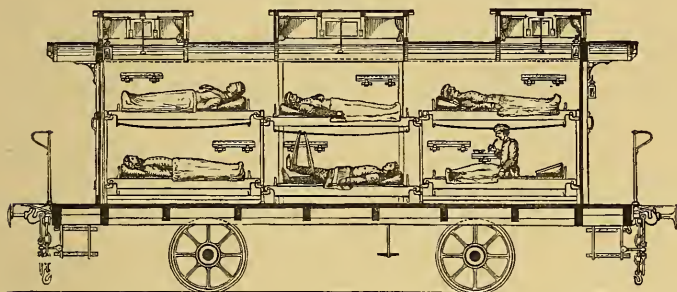
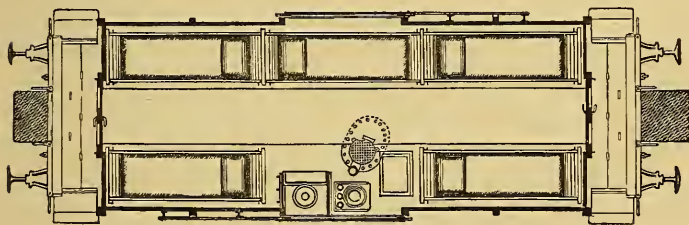


Fig 38.



SICK-TRANSPORT WAGGON OF THE AUSTRIAN BRANCH OF THE KNIGHTS OF MALTA.—FOR TEN PATIENTS LYING DOWN.

Above—the section ; below—the plan.

Special iron standards are screwed into the floor of the carriage, and also fastened to the sides of the carriage, and these may be readily compared to the iron standards of our barrack-room tables, or somewhat like a small bed-room towel-horse. On these standards the stretchers are laid in two tiers, one above the other. The whole thing is most simple and easily understood. Ropes for the patients to help themselves up by are hung over each cot, and there

is a shelf to hold bottles, drinking-vessels, &c., screwed on to the walls of the carriage.

Ventilation of an elaborate character is arranged for by opening in the roof. The provision of a lavatory, latrine and stove in each carriage we have noted already.

Electric, and we presume telephonic communication, or speaking-tubes, unite the carriages, and keep touch between each portion of the staff of the train.

Five such carriages are placed consecutively on either side of the magazine waggon. This contains the linen store of the train, and all the needful changes of under-clothing for the sick. It also contains spare mattresses, pillows, stretchers, &c.

The Pharmacy or Dispensary portion of the waggon is easily described.

It is like a very first-class ship's dispensary placed on wheels. In it are the medicaments, instruments, medical documents, &c., for the medical staff, and a couch for the dispenser. Any naval architect would fit up such a carriage for a dispensary in a day or two. In fact, both in the dining-room, kitchen and dispensary we could learn much from ship's arrangements. A bath is also fitted up in the magazine waggon.

In the book before mentioned "Freiwilliger Sanitäts-Dienst im Kriege," issued by the Malleseer Ritter-Orders, will be found every detail of construction of these trains, so clearly drawn as to enable any ordinary constructor to act at once upon them.

The trains are kept ready at all times by the Maltese Knights for the Austrian War Office, and a definite agreement exists defining the duties of the Order, and the rights of the Government.

In the various European countries trains of this description, more or less elaborate, either exist, or the *matériel* needed for their instalment is ready to hand in the store-houses of the Government or the Aid Societies. In Germany the 4th-class railway carriages are now made to open at the end instead of at the sides, and these 4th-

class carriages are converted into ambulance trains on the outbreak of war. When once we understand the main lines which have guided Baron Mundy in the organization of the Austrian trains above described, we can easily grasp the various arrangements of other countries, for they are all based on the same idea.

We now turn to note the arrangements made in countries or places where *train* systems are not possible, owing to the carriage opening at the sides and not at the ends. In all these cases the custom seems to be to utilise the goods waggons of the various railways, and in the clear space these carriages allow, to fit up extempore arrangements for the wounded.

What is mainly needed is some method of breaking the jarring of the railway carriage as it traverses the line, and some method of suspending the wounded on their stretchers in the carriages. We may note four methods of achieving this, viz. :

Zavodovsky's system ;
Grund's system ;
Beaufort's system ; and the
Hamburg system.

There are also many others.

Zavodovsky's System consists of fastening a cable (Fig. 39, A. A.) into hooks (*a a*) screwed on to the top of the sides of the carriage. To this cable a pole is fastened by ropes, from which pole hang down ropes (*c c c c*) with loops, in which the handles of the stretchers are placed in two tiers, one above the other.

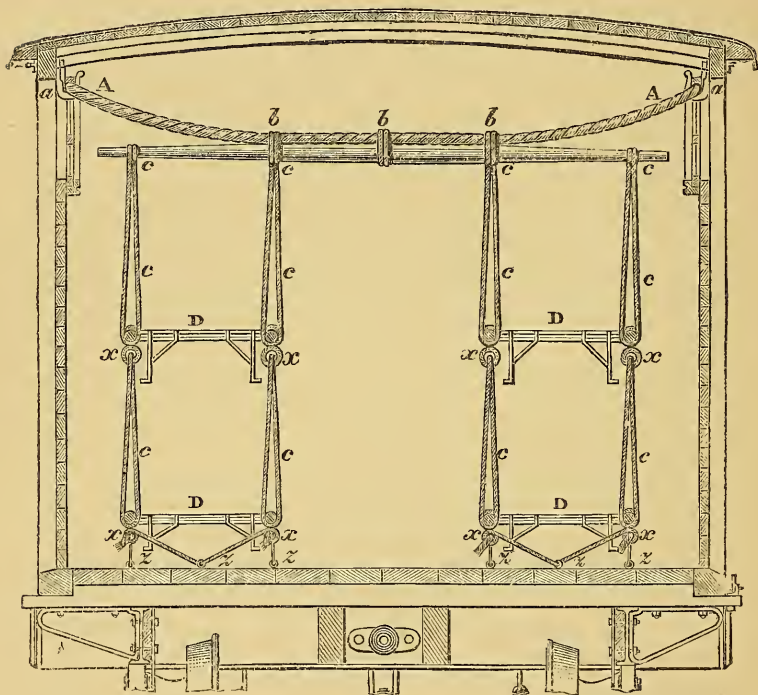
The lower tier of stretchers are fastened by ropes to the floor of the waggon, to prevent the swaying motion induced by the carriage in its progress.

This system is useful when a number of luggage waggons have to be rapidly converted into ambulance waggons. A single waggon will thus hold eight patients lying down ; four on either side of the door of the waggon.

Grund's System (Fig. 40) of converting goods waggon for use of sick or wounded consists in placing two spring supports

on the floor of the waggon. A pole is fastened from one spring to the other, generally sufficient in width to rest three stretchers. On this pole, supported by the springs, the heads of the stretchers are rested, and a similar pole on similar springs receives the foot of the stretcher. By this

Fig. 39.



TRANSVERSE SECTION OF GOODS WAGGON, SHOWING ZAVODOVSKY'S METHOD OF SUSPENDING STRETCHERS BY ROPES.

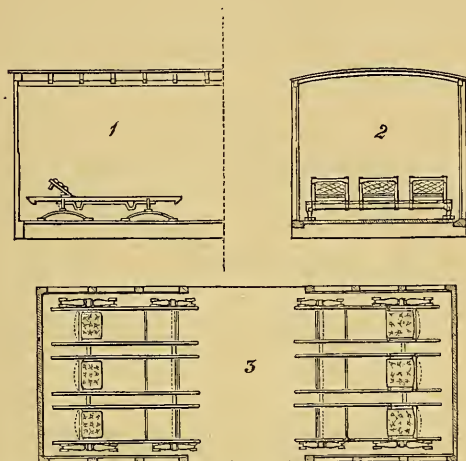
From Surgeon-General Longmore's 'Gunshot Injuries.'

system each goods waggon can hold six lying-down patients.

Count Beaufort's system of converting a luggage waggon for carrying sick is practically the same as *Grund's* system. A portable case, Fig. 41, No. 1—which packs up for transit as in No. 2—receives the stretcher as

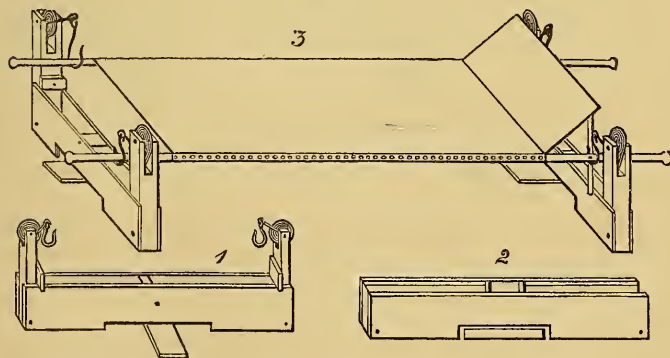
in No. 3—and the springs receive the handles of the stretcher, and thus the shaking of the carriage is counteracted.

Fig. 40.



GRUND'S SYSTEM OF CONVERTING GOODS WAGGONS INTO SICK-TRANSPORT WAGGONS BY A SPRING SUPPORT UNDER THE STRETCHERS.

Fig. 41.

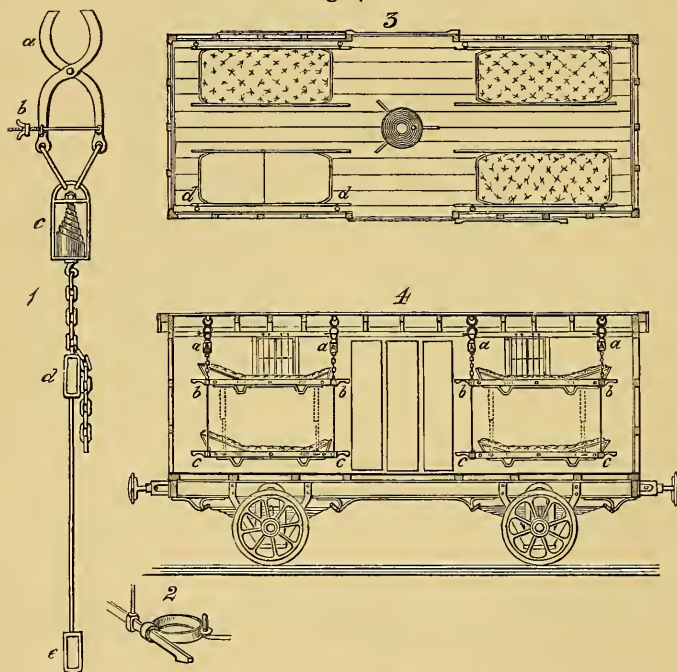


BEAUFORT'S SYSTEM OF STRETCHER-RESTS FOR RAILWAY TRAVELLING.

This system is very portable, and the rests can be made up in any number before a campaign, and can be at once ready for war service.

The Hamburg system of goods waggon conversion seems very simple, and has much to commend it. A spring-suspender (Fig. 42, No. 1) has at its upper extremity a clamp (*a*), with screw (*b*), which can fasten on to the timber of the roof of the carriage, and be screwed there. There is a coiled spring at (*c*) which breaks the force of

Fig. 42.



HAMBURG SYSTEM OF STRETCHER SUSPENSION IN A GOODS WAGGON.

No. 1. The spring-suspender, with clamp. No. 2. The side-fastening.

No. 3. Plan of carriage. No. 4. Section, with stretchers inside.

the motion of the carriage. Further down, suspended by an iron chain, which can be raised or lowered, is an iron rod with a rectangular holder, into which the stretcher-handle can be slipped.

There is a second stretcher suspended in a similar manner lower down on the same bar.

Four such spring-suspenders will support two stretchers, and the patient travels with much comfort. These suspenders were much commended by some German army surgeons who had tried them, and they certainly are more rapidly adjusted than Zavodovsky's cables.

To prevent swaying during transit, there is a side-fastening which binds the stretcher to the side of the carriage. The complete equipment for eight patients, consisting of 16 clamps, complete with chains, bars and hooks, packed in a chest, can be obtained from the firm of F. G. Dittmann, Wagen-Fabrik, 52 Markus-Strasse, Berlin. Each spring-suspender costs about 17 German marks, or the complete outfit for a carriage for eight patients, minus stretchers, would cost about 300 German marks.

In all these systems of extempore conversion of carriages one will miss the completeness of the Mundy Austrian trains; but war is a time when extempore action is constantly called for, and with the four systems described above, there should be some chance of making a good extemporised ambulance conveyance. There are several other systems of conversion, but they practically group themselves into suspension from the top of the carriage, or rest on the floor of the waggon.

CIVIL RAILWAY SICK-TRANSPORT SYSTEMS.

Very few conveniences are at present available for civil sick-transport by rail. Invalids still travel with difficulty and expense by our railway systems. What is much needed is suitable invalid carriages on our main lines, to be hired at rates within the limits of ordinary incomes.

We very much need in England better arrangements for the many railway accidents we are liable to.

Every guard's-van of every passenger train should have a stretcher compulsorily carried in it, and a basket of bandages and restoratives.

Every railway station should have a stretcher as part of

its equipment. A carrying chair for invalids is also much needed at every station. There should be means of suspending a stretcher in every guard's-van, either by the Hamburg system or other ready method.

To every "break-down train" sent to aid at accidents on railway lines should be attached a regular sick-transport waggon, and the company on whose line the accident occurred should provide suitable conveyance for its victims. In this waggon should be dressings, restoratives, and stretchers for conveying the wounded to the carriage, and to the hospitals afterwards.

The development of sleeping-cars we should watch with interest, as at once on the outbreak of any war we could annex these carriages and convert them into ambulance conveyances. As our great City hospitals develop country branches round London, we may probably find ambulance trains running from London to the outlying hospitals, as a matter of routine daily.

CHAPTER XII.

MARINE AMBULANCE ARRANGEMENTS.

Various Rope Knots used by Sailors in carrying wounded men—The ordinary Navy Cot—The Lowmoor Jacket—MacDonald's Ambulance Lift—MacDonald's Ambulance Lowerer—The Gorgas Ambulance Cot—Ambulance Launches—Ambulance Steamers, 'The Red Cross'—Hospital Ships, 'The Victor Emmanuel.'

WE may here say a very few words about marine ambulance arrangements. Very much progress does not seem to have been made in this direction in naval circles, whether of the Royal or Mercantile Marine.

Inspector-General Macdonald, R.N., is the chief authority to be consulted on this subject ; and in his 'Naval Hygiene' the subject will be found fully dealt with.

The existing arrangement for naval ambulance aid may be classified as follows :—

1. Various rope-knots used for carrying wounded men.
2. The ordinary Navy cot.
3. The Lowmoor Jacket.
4. Macdonald's Ambulance Lift.
5. Macdonald's "Ambulance Lowerer" for ship's tops.
6. Gorgas Ambulance Cot.
7. Ambulance Launches—Portsmouth Launch.
8. Ambulance Steamers—'The Red Cross.'
9. Hospital Ships—'The Victor Emmanuel.'

We will briefly deal with these headings.

VARIOUS "SAILORS' KNOTS" USED IN TRANSPORTING, OR LOWERING WOUNDED—

Inspector-General Macdonald states that sailors, with their proverbial handiness in dealing with ropes, contrive

to make very useful knots, with which they can lower or lift helpless men about the ship. These knots are—

The bowline.

The running bowline.

The bowline on the bight.

The clew hitch.

The grummet.

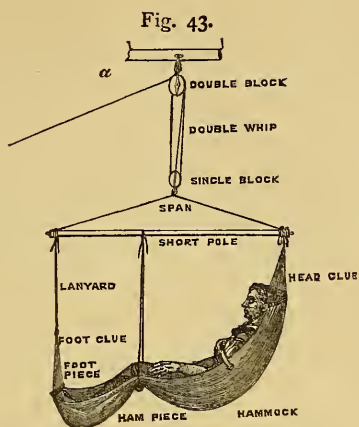
Some of these knots are made round the body of the injured person, and form both a seat and a support in which the patient sits and is lowered.

The Ordinary Navy Cot.—This cumbrous article is sometimes used for carrying sick and wounded men. As it is at least 6 feet long by 28 inches wide, the patient rolls about in it; and if it is at all out of the horizontal, the patient slips downwards towards the bottom. As sick men have on board ship to be passed through narrow hatchways, this cot is extremely undesirable.

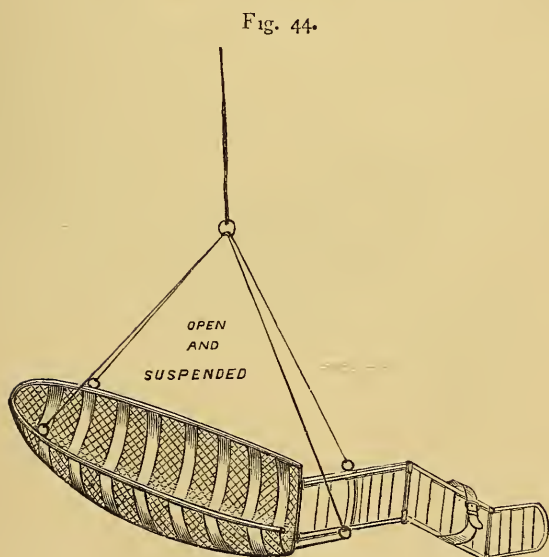
The Lowmoor Jacket, previously described in the chapter on stretchers, seems to be a useful article for naval ambulance service. It is separate from the stretcher, and hence the army-pattern stretcher could be utilised for naval service if the detached jacket were supplied with it. It is simply a jacket surrounding the chest, with strong back pieces running up behind the patient's back and passing over an iron bar, which is slipped over the handles of the stretcher. Another canvas support passes between the patient's thighs, and still further aids in supporting the weight. A web stirrup can be made for the feet, and this is a great aid also.

Practically, the lowering of a man through a narrow hatchway, or drawing him up a narrow mine-shaft, needs the same, or very similar, appliances.

Macdonald's Ambulance Lift.—With the view of remedying the defects of the naval cot or hammock as a means of carrying or lowering patients, Inspector-General Macdonald, R.N., has devised an "ambulance lift." An ordinary



MACDONALD'S NAVAL AMBULANCE LIFT.



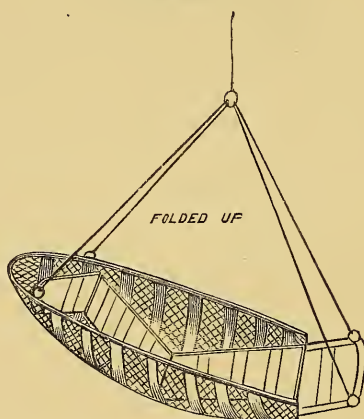
INSPECTOR-GENERAL MACDONALD'S "AMBULANCE LOWERER," FOR USE IN THE "TOPS" OF WAR VESSELS.

hammock is used, the clew and lanyards remaining intact. A short rounded piece of wood, called a "ham pin," is secured transversely beneath the hammock, so as to

correspond with the bend of the patient's knee. Three points of suspension are thus obtained from a short pole, which is hung to a longer pole, or simply connected by a span with the blocks (pulleys) used in lowering the patient.

Macdonald's Ambulance Lowerer. — Inspector-General Macdonald has also devised a lowering apparatus, here depicted, which is kept in the "tops" of a ship, and in it a man can be easily lowered at an angle of about 30° , through a hatchway only 4 feet in diameter.

Fig. 45.



MACDONALD'S AMBULANCE LOWERER, FOLDED UP.

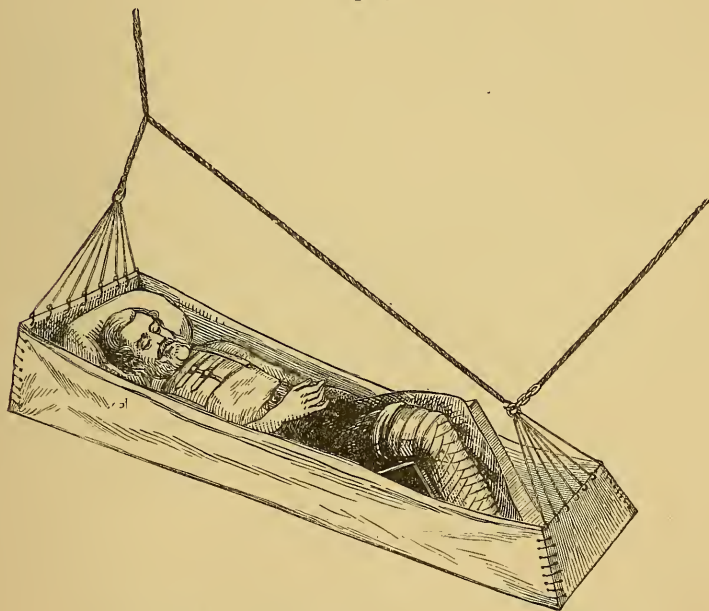
Medical Inspector-General Gorgas's Ambulance Lift. — This cot is the invention of Dr. Gorgas, an officer of the United States Navy. The cot is 5 feet 8 inches long by 21 inches wide, and this small size, with the addition of a breast-band, aids in securing the patient.

The important part, however, is a double inclined plane placed under the buttocks, thighs and knees, and legs, as in the plate. This prevents the patient slipping down in the cot. By the ropes attached, the foot of the cot may be lowered until the position of the patient is almost vertical, and so he can be lowered into the hatchways. It is re-

commended to have canvas loops or beackets on the sides of the frame of the cot, to act as handles for ordinary lifting, and through the same handles poles may be passed, converting the cot into a stretcher.

Ambulance Launches.—For the conveyance of sick from ships lying off a port, to hospitals on shore, or from the shore to hospital ships, as in war time, the arrangements have up to our own days been very imperfect, and no

Fig. 46.

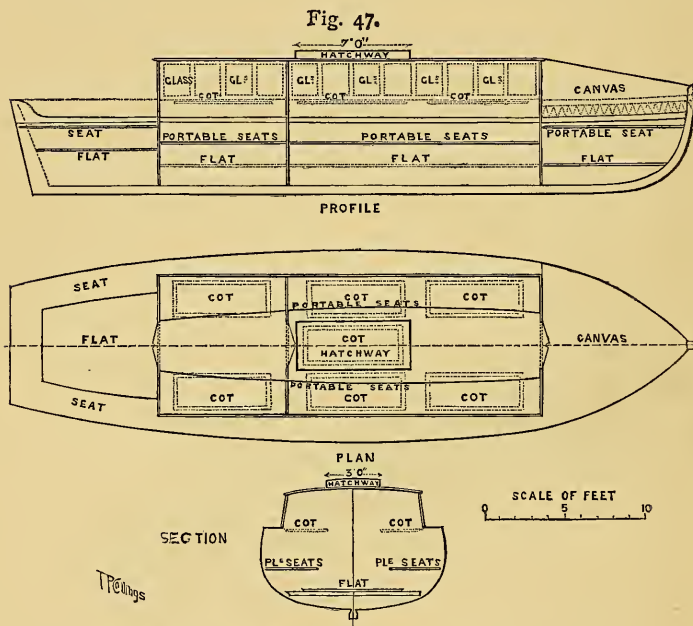


AMBULANCE COT OF DR. GORGAS, UNITED STATES NAVY.

regular arrangements have ever been made to shield the sick from the weather, or to carry them without fear of their injuries being aggravated.

A new departure has now been made in this respect, and through the courtesy of Sir John Watt Reid, the Medical Director-General of the Royal Navy, we are enabled to give a drawing of an ambulance launch just completed at Portsmouth Dockyard. It is to be used in carrying sick and

wounded from the vessels in Portsmouth Harbour to the great Naval Hospital at Haslar. It is an ordinary service pattern launch, 42 feet in length, housed in, and divided into two compartments ; the smaller for four officers lying down, the larger for eight men in the same position. There is also room for others not needing lying-down accommodation. There is a cot-hatchway in the centre of the roof, through



AMBULANCE LAUNCH FOR CONVEYING SICK MEN FROM SHIP TO HOSPITAL.

which the sick men lying on their cots, as removed from their ships, can be lowered and placed under shelter on the cot-stands in the cabin. When all the cot-stands are filled, the portable seats can be drawn out, and further utilised for lying-down accommodation.

This valuable boon to the sick will doubtless soon be copied in other large ports, and such a launch will doubtless form part of the equipment of every hospital ship in

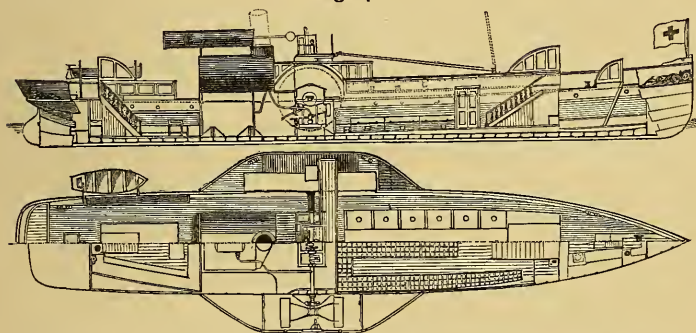
the future. The launch we have been describing has no steam-aid of its own, and requires to be towed by another vessel.

It is well lighted and ventilated, and a stove can be fitted for use in winter time.

AMBULANCE STEAMERS.

There is, as far as we are aware, but one existing specimen of an ambulance steamer devoted solely to the carrying of sick and wounded persons ; this is the ambu-

Fig. 48.



AMBULANCE STEAMER "RED CROSS," METROPOLITAN ASYLUM BOARD,
LONDON.

lance steamer 'Red Cross,' built for the London Metropolitan Asylums Board, and used for the conveyance of infectious cases of disease from the London receiving wharves to the hospital ships off Dartford.

This paddle-wheel steamer was designed by Mr. Adam Miller, N.A., and built by Edwards and Symes, Cubitt Town, Poplar, E. London. It is 105 feet long, 16 feet wide, and 6 feet 9 in. in depth ; the hull is principally of iron, with a strong keel.

It has a silent discharge steam-apparatus to prevent the noise caused by the safety-valves blowing off steam when the engines are at rest.

The vessel is built in six water-tight compartments. An account of the steamer, with large drawing, will be found in the 'Marine Engineer' newspaper of March 1, 1884.

It consists mainly of two portions ; one, the fore part, forward of the funnel, devoted to the reception of infectious cases ; and the stern portion, which has a saloon or waiting-room for the use of the patients returning cured from the hospital ships.

Forward of the infectious section, but separate from it entirely, is a small room for the crew, and the captain has a cabin near the saloon or stern-end of the vessel.

The infectious disease portion of the steamer, or "hospital," is divided down the centre by a partition into two parts, one for males and one for females—with a doorway between, for the medical staff and nurses.

The lying-down accommodation consists of couches or settees, running continuously round the sides of the hospital, and on these settees the patients lie, covered by blankets, &c. The hospital is reached by a sloping stair from the deck, and is well lit and partially ventilated from the deck by side-lights.

Glancing at this steamer, one is led to ask the question if this down-stairs system of hospital is suitable for an infectious-disease conveyance vessel ; and one is forced to think that a deck-house system on the deck level, and freely open to the perflation of air, would be a better plan. The little steamer is for use in the River Thames only, so no great sea-going power is needed, and by deck-house state-room cabins, raised from the level of the deck, the sick would be carried at once into the hospital, and the hospital itself could be very readily ventilated. Doubtless there may be nautical reasons against this proposal, but at first sight it seems a better method of construction.

HOSPITAL SHIPS.

Type, the 'Victor Emmanuel.' For the transportation of sick and wounded from the seat of war to our own

country, regularly equipped and specially furnished "Hospital-ships" are now requisite. In our old wars, even so lately as the Crimean campaign, the horrors of the middle-passage were extreme, and the condition of some of the so-called hospital ships, used at first to transport sick and wounded men to Scutari from the front, was completely bad.*

It is absolutely essential at the outbreak of a war to have a definite plan ready in the War Office for the equipment of this class of vessels, and that their staff of attendants and interior economy should be completely understood. We have made great progress in this direction of late years, and during the recent Egyptian campaigns the 'Carthage' hospital-ship was of immense use to the army. The outline of the system adopted is to choose a vessel with roomy 'tween-decks. This is done by the Transport Department of the Admiralty; the same officials fit up and equip the vessel, and then hand it over to the War Office for its staff of officials and attendants.

The main-deck is generally converted into the hospital, and cots or portable hanging bedsteads, so arranged as not to swing with the motion of the vessel, are suspended in regular lines on this deck.

A certain portion of the space is usually screened off for sick officers as special accommodation.

The convalescent patients are lodged in a lower or gun-deck, and the hospital attendants are also berthed in the same deck.

The main needs of hospital-ships are a defined nursing staff, so numerous as to afford regular hours of rest for those employed in this fatiguing duty, and to provide fully for the very important night-nursing.

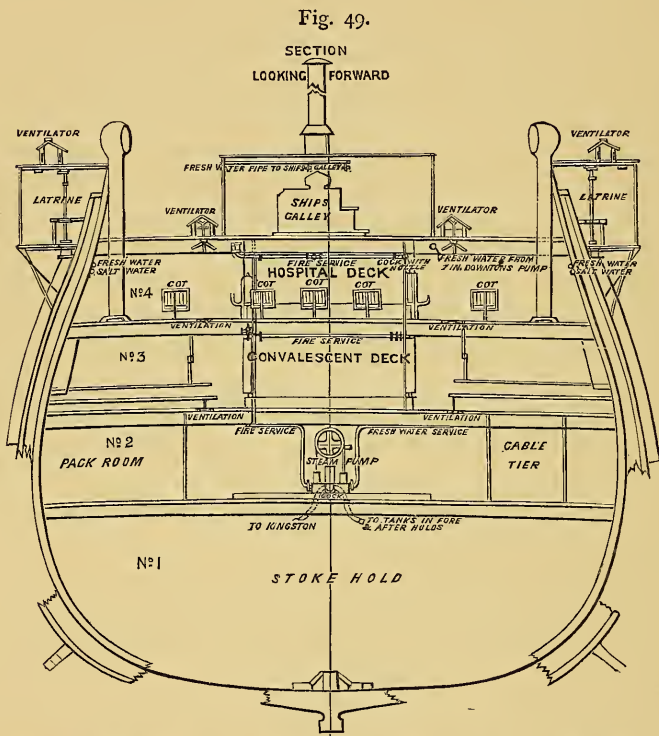
The latrine arrangements also need to be very complete.

The cooking, as in all hospitals, needs to be carefully provided for, and spacious galleys are always needed.

* Those who desire to read a very complete and interesting account of a hospital-ship, will find Surgeon-Major Bleckley's report on the 'Victor Emmanuel' very useful. A.M.D. Blue-book, 1873.

The laundry is a most essential part of a hospital ship, and on this point Dr. Bleckley's report is very important.

Nothing so degrades the *moral* of sick men as being attacked by vermin; and despite the so-called pomp and glory of war, the almost constant attendants on the soldier

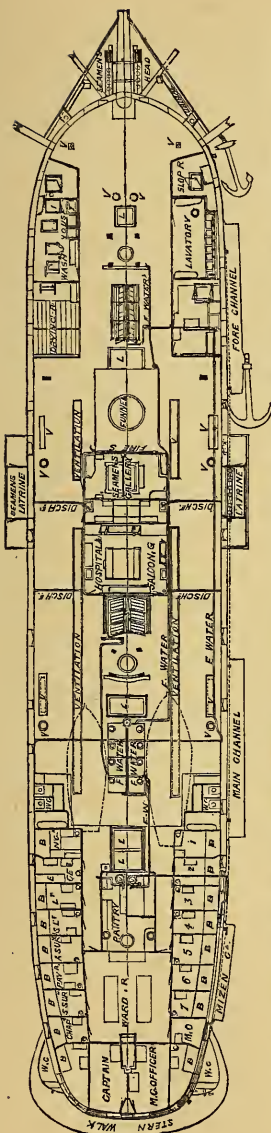


SECTION OF THE 'VICTOR EMMANUEL' HOSPITAL SHIP, SHOWING
"HOSPITAL DECK" AND CONVALESCENT DECK.

in the field are vermin. It is only by the very utmost care an army can avoid being lice-infested.

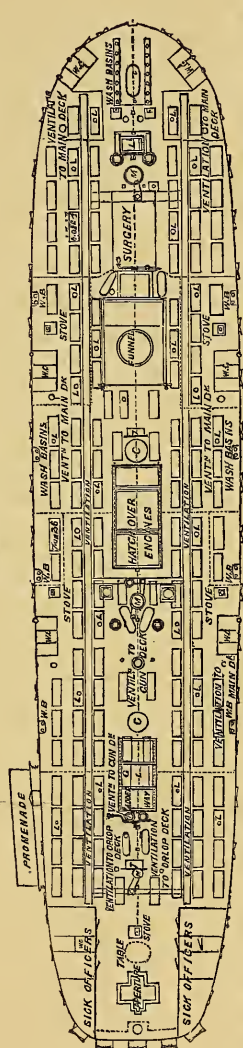
When men fall into bad health, or become helpless in hospitals, the need of keeping them free from lice is paramount. It cannot be done without good laundry arrangements, so as to wash and constantly change the clothes. Every general hospital, every field hospital, and certainly

Fig. 50.



PLAN OF UPPER DECK OF 'VICTOR EMMANUEL' HOSPITAL SHIP, SHOWING PORTION OF THE KITCHENS, LAUNDRY, LAVATORY, MEDICAL OFFICER'S CABINS, AND CABINS OF THE OFFICERS OF THE SHIP.

Fig. 51.



PLAN OF HOSPITAL DECK OF 'VICTOR EMMANUEL' HOSPITAL SHIP, SHOWING GENERAL ARRANGEMENT OF COTS, SURGERY, SICK OFFICERS' QUARTERS, ETC.

every hospital-ship, should have a completely equipped laundry, so that our men may escape this degrading and

[H. 28.]

disgusting scourge. Ghastly stories are told of the condition of the sick in the earlier days of the Crimean campaign from this odious and loathsome parasite, and the like must never happen again. It can only be avoided by organization beforehand, and by adding to the hospital staff men with washing-machines. Every convenience exists on a hospital-ship to accomplish this work, or if there be a want of space, a separate vessel should be fitted up for a laundry. The *moral* of a sick man is ruthlessly killed out, if he be vermin-covered.

The plates given here are copies of those attached to Dr. Bleckley's interesting and instructive reports on the 'Victor Emmanuel' hospital-ship utilised during the Ashanti campaigns.

The addition of an ambulance launch, and of definitely constructed ambulance-lifts to the equipment of hospital-ships, will doubtless be made in any future campaign.

CHAPTER XIII.

AMBULANCE TENTS AND HUTS.

Proposals for the more general use of Huts and Tents in infectious disease—The English Bell Tent—The Hospital Marquee—Indian Tents—American Tents—The Tollet system of Tents—The Dœcker Felt Huts.

FOR the protection of sick and wounded in war, portable tents and huts will always be largely used, and the probability is that, even in civil communities like cities and towns, we are only at the beginning of the use of temporary shelters such as tents and huts for housing infectious diseases, surgical operation cases, and other ailments where abundant air is needed.

Hospitals, however well constructed and however sanitary in their surroundings, would benefit by having their wards left empty and idle for a time, and one ready way of doing this is to be able to pitch in the hospital grounds suitable tents, or portable huts, in which during certain seasons of the year most cases could be treated. The military medical service, with its abundant stores of tents, will probably be the first to push this system into a regular practice, and it will be of much use to that service as giving it the opportunity of testing its *matériel* under conditions similar to war service.

There is, unfortunately, an idea in many untravelled Englishmen's minds as to the discomfort of tents; but all of us who have served in India are well aware that comfort can be completely secured under a canvas roof. There is also a sense of freedom from bad ventilation and unhealthy house-conditions very much felt by those who live in tents.

For infectious diseases' treatment, the idea seems daily to gain ground that expensive substantial stone or brick edifices are hardly the most suited, and it will probably be for the housing of such cases we shall see the first steps taken in providing tent or hut-accommodation.

When we remember the extreme difficulty with which scarlatina, diphtheria, and the various infectious diseases are separated in ordinary private houses, is it too much to hope that one day, on the occurrence of such cases in a household, it may be quite easy to apply for a suitable tent, with proper flooring and camp furniture, which could be pitched in the garden or grounds of the house attacked, and where the nurse and the patient would be completely separated from the remainder of the family?

One may compare the feeling on this head to the very common opinion existing in the past, that patients with high temperatures in fever should not be placed in cold baths, lest internal congestions should ensue, and probably the tent treatment of infectious cases, surgical operations, and perhaps of obstetric cases, may one day be quite as common as cold immersion now is in the high temperatures of fever. Tents with double roofs are very common in India, and keep out the heat, and keep in the warmth very well. Stoves are easily used in tents; our hospital marquees have regularly cut floorings that fit the interior; and surely, with all these aids, comfort can be well secured, and segregation be made as complete as it is to-day incomplete. Tents and huts too can be easily disinfected by washing or by heat, and it may one day be possible to receive on loan from the municipal authorities the needful tents required for the treatment of special disease.

The complete manner in which the *dejectæ* can be dealt with in tent hospitals is an important point, as it prevents all use of the house closets.

We may briefly notice some ordinary tents in the following order:—

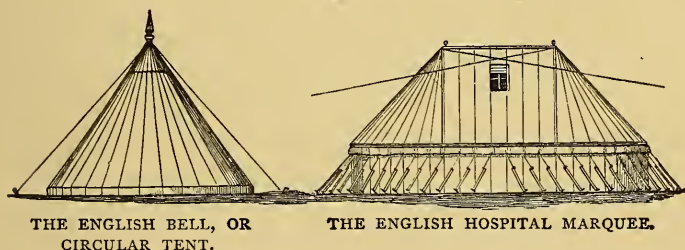
- (a.) The Bell or Circular Tent,
- (b.) The Hospital Marquee.

- (c.) Indian Tents.
- (d.) American Tents.
- (e.) The Tollet-system Tents.
- (f.) The Dœcker Felt Huts.

(a.) *The Bell or Circular Tent* is the ordinary war tent of the English army. It is also used for the movable field hospitals in the front, and for the operating tents of the bearer-companies. It is 10 feet high, 14 feet diameter, weighs 65 lbs. and cost £5. It is intended to hold 18 men in war time, 12 at ordinary times.

For hospital purposes it is not appropriate. Four men on stretchers can be laid in it rectangularly, but four is a

Fig. 52.



bad unit for supervision and nursing; and the construction is not favourable to moving about in it for nursing purposes. Its ventilation is defective, and must be so, so long as it has only one doorway.

For the bearer-company operating tent it is useless, as the operating table cannot stand in it, and if it could, the doctors cannot move round it with comfort.

The English Hospital Marquee is the regulation tent for permanent hospitals: it is 28 feet long, 14 feet wide, 12 feet high, and weighs 500 lbs. Its price is about £22 13s. at the Royal Arsenal, Woolwich. It is supposed to hold 18 sick, but really takes 10 with comfort. It is a singularly, nay absurdly, difficult tent to pitch correctly. As it is not rectangular, but has rounded ends, the laying out the tent pegs and marking the space needed is a geometrical problem, completely foreign to rapid war-pitching.

Further, it is a clear principle that all hospital tents should be able to join together end to end to form larger combinations. The absurd circular ends of this tent prevent another tent being closed up upon it to form a larger hospital ward. This is very fatal to its prestige as a useful article of equipment, and we should not regret to see it consigned to the flower show or the lawn-tennis ground. For war, it is not the thing we want.

A war hospital-tent should be before everything rectangular, able to join on end to end with other tents, and very easily pitched, so that on a dark night or early morning march it can be pitched or struck without the geometrical problem now needed with our hospital marquee. It should have very few pegs indeed, while our present marquee has a bewilderingly needless number, 184!!!

Indian Tents.—The ordinary Indian *privates' tent* does singularly well for a hospital tent, holding eight men with great comfort. It is rectangular, with two uprights, and one cross-pole supporting the roof. It is used commonly all over the plains of India as a hospital tent.

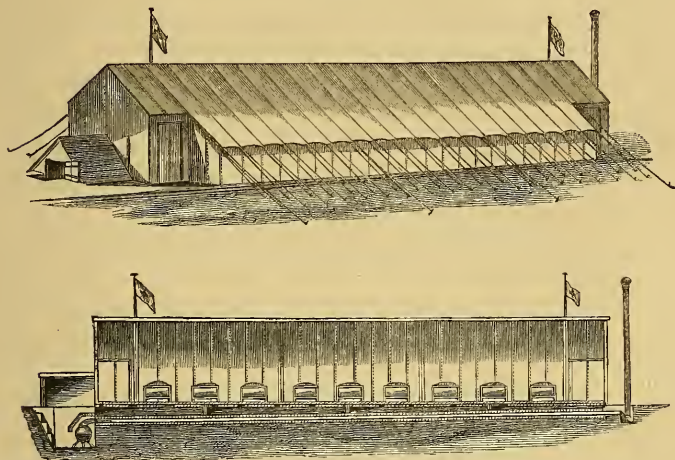
The Lascar Pall Tent was used with much comfort during the Affghan war as a hospital tent. It is easily pitched, and very safe in storm or gales. It is a tent with three upright and one ridge pole, and is like the section of a prism. It holds eight men with comfort in mountain campaigns. Probably it would suit well for any kind of European campaigns as a hospital or operating tent, as the sides can be raised, and there is perfect ventilation.

Mountain Battery Tents.—Some very useful tents are issued to the Indian Mountain Batteries; they are small and light, and would do well for the staff of the field hospitals.

American Tents.—A plate is here given, showing a favourite shape of American war hospital-tent. A good hospital tent would be made by cutting this long tent into sections holding ten beds, five on each side, with curtains closing the ends. Such section tents could be united, end to end, at any time to form larger combinations.

The system of warming tents for winter campaigns is shown in the lower picture. A furnace is built at one end of the tent in a hole dug in the ground, and the heat is

Fig. 53.

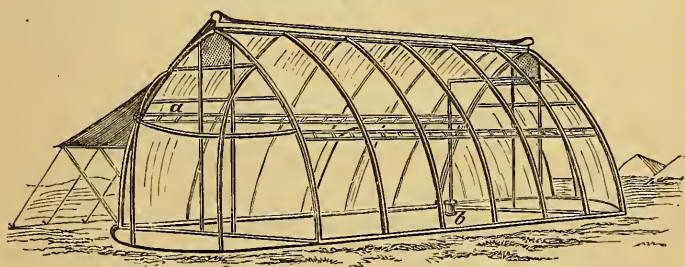


AMERICAN WAR HOSPITAL TENTS.

The upper representing the tents as pitched ; the lower showing the system of warming for winter campaign.

carried either by iron pipes, or by a stone-lined or brick channel running under the tent, and ending in a chimney at the opposite end of the tent.

Fig. 54.



FRAME WORK OF A TENT ON THE TOLLET SYSTEM, SHOWING THE IRON RIBS RUNNING INTO A CENTRAL RIDGE-POLE—STOVE AT *b*.

The Tollet-system of ambulance, or hospital tents or barracks, is spoken favourably of, and has been adopted in the French and Italian services (Fig. 54.) The central tent-poles are abolished, and the structure is supported by curved iron ribs running into a longitudinal ridge-pole. The curves are ogival in form, and there is no dead angle of non-ventilation. The interior of the tent is lined with a non-combustible canvas, and there is an external covering of a waterproofed material. The sides can be raised at any place, for ventilation or to form a verandah. A stove can be placed in the interior, and in a Swiss winter is said to keep the tent perfectly comfortable.

The only drawback is the difficulty of transport, but this is not insurmountable.

Inspector-General Mouat, M.D., of the Local Government Board, speaks very favourably of this system of housing sick.

The prices we are unable to state, but the address of the contractors is Société Nouvelle de Constructions Système Tollet, 61 Rue Caumartin, Paris.

The Dæcker Felt Hospital Huts.—This is a system of huts or houses devised by Captain Dæcker of the Royal Danish army. It has received the Gold Medal of the German Empress at the Berlin Hygienic Exhibition of 1883. It consists of light wooden frames, covered with a special felt called Carton felt, lined with canvas.

The fastening of the frames is so simple, that the erection of huts can be very rapidly carried out. The weight is said to be one third that of wooden huts, and they are said to last much longer. The price is about one-third that of wooden huts.

They maintain a very equable temperature, a simple stove being all that is needed to warm them. After use, the tent can be taken down, each panel washed with a disinfectant, and packed away flat in a case.

Professor Esmarch is said to approve of them, and to be himself using them.

Sir Robert Rawlinson has commended them highly.

At the Kings Norton Rural Sanitary Authority, near Birmingham, they are used for small-pox cases, and have given satisfaction.

A hospital hut with ridge ventilators, size 36 feet in length by 16 feet in width, and the walls 7 feet 3 inches, with deal flooring and packing-cases, cost, delivered in London, £175.

The address of the maker's office or agents, is Puggaard and Galschiot, 50 Boulevard Haussman, Paris—to whom those needing further particulars should apply.

CONCLUSION.



THE object aimed at in these pages has been to write so simple a paper on Ambulance Organization, Equipment, and Transport, that the ordinary visitor to the International Health Exhibition of 1884, casually taking up the handbook, might be able, without difficulty, to gather some idea of the aims and objects, and the difficulties of Ambulance work.

If these pages at all fulfil this aim, the writer will be well rewarded.

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